WAGO•I/O•SYSTEM 750

Modular I/O System

INTERBUS S

Manual

Technical description,
installation and
configuration

750-132
Version 2.2.2

WAGO ®
INNOVATIVE CONNECTIONS

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Every conceivable measure has been taken to ensure the correctness and completeness of this documentation. However, as errors can never be fully excluded we would appreciate any information or ideas at any time.

We wish to point out that the software and hardware terms as well as the trademarks of companies used and/or mentioned in the present manual are generally trademark or patent protected.

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IMPORTANT!

For fast, trouble free installation and start up of the devices described in this manual, the user should carefully read and follow the advice and explanations offered in this guide.

Explanation of symbols used:

The **EXCLAMATION POINT** symbol is used when:

a) improper handling could cause damage or destruction of the hard- or software

b) possible injury to persons when interfacing to dangerous process peripherals.
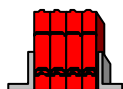
The **FINGER** symbol describes routines or gives advice for the efficient use of the devices and optimization of the software.

FUNCTION The **FUNCTION** symbol refers to helpful notes which are necessary for the correct function. These remarks should be followed.

The **QUESTION MARK** gives an explanation of terms.

The symbol **BOOKS** gives references to additional literature, manuals and data sheets.

The user is most important to us:
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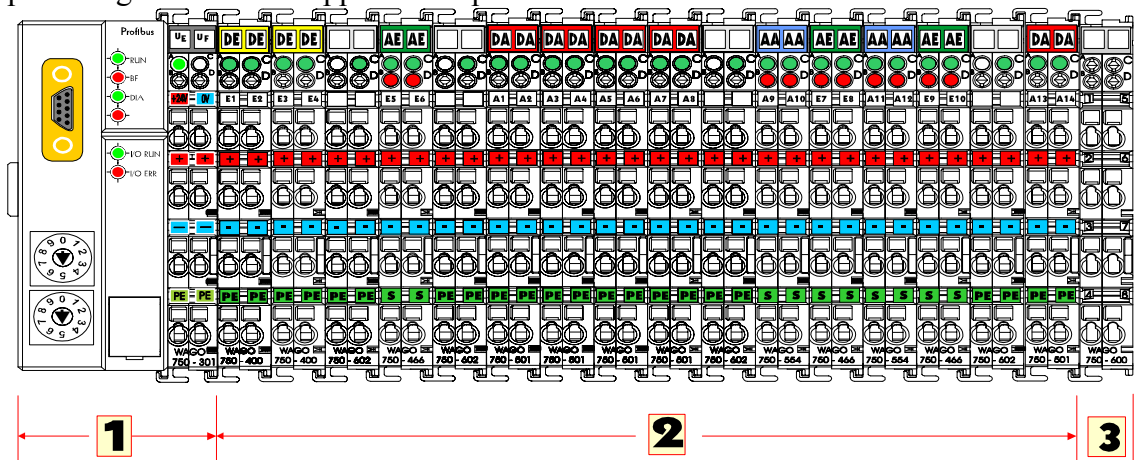
WAGO➠I/O➠SYSTEM

Table of contents chapter 2

1   The WAGO I/O System

The WAGO I/O SYSTEM consists of various components which are capable of providing modular and application specific fieldbus nodes for various fieldbusses.

I11.1 Setting up a fieldbus node with the WAGO I/O SYSTEM

General remark:
A fieldbus node consists in principle of a fieldbus coupler at the front end, a number of special function modules and a termination module which is placed at the other end.

1 - Buscoupler
The Buscoupler forms the link between the fieldbus and the field devices with their I/O functions. All control functions required for the faultless operation of the I/O functions are carried out by the coupler. The connection to different fieldbus systems is established by each of the corresponding Buscouplers, e.g. for PROFIBUS, INTERBUS S, II/O LIGHTBUS, CAN, ModBus etc. In this way a change of the fieldbus system is possible.

2 - Function modules
In the function modules, the incoming process data ais converted. Corresponding to the different requirements, special function modules are available for a variety of functions. There are digital and analog inputs and outputs and modules for special functions. The modules are described in the following chapters.

3 - Termination module
A termination module is needed for faultless operation of the node. The termination module is always placed as the last module in order to obtain a termination of the fieldbus node. This module has no I/O function.

Assembly of the WAGO I/O System

All components of the system can be snapped directly on a carrier rail according to EN 50022 (DIN 35).

When snapping the analog or digital components onto the rail, no special sequence must be observed. The secure positioning and connection of the individual function modules and the coupler is provided by a snap-in system. This snap-in system provides automatic interlocking onto the DIN rail assembly. It is always possible to remove a function module or the Buscoupler from the assembly by pulling the orange pull-tab.

Please note, that the power supply of the field side as well as the data transmission are interrupted. It has to be ensured that the interruption of PE will not put personnel or equipment in danger.
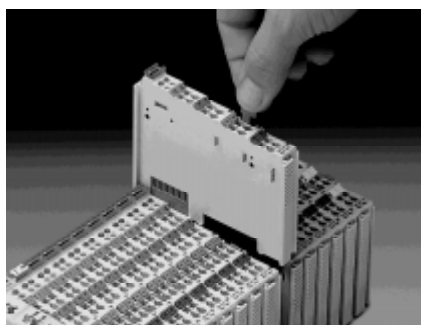
With a CAGE CLAMP, conductors with a cross section of 0.08 to 2.5mm^2 /AWG 18-14 can be connected. Vibration proof, fast and maintenance-free. You simply introduce a screwdriver or an operating tool into the operating slot under the clamping unit. The CAGE CLAMP spring is pressed down. You can now introduce the wire into the clamping unit. Withdraw the operating tool and the conductor is automatically clamped.

The clamping force adjusts automatically to the conductor cross section. The flat clamping face of the CAGE CLAMP spring presses the conductor against the current bar without damage. Any deformation or movement of the conductor is compensated, thus eliminating the risk of a loose connection. The contact point between conductor and CAGE CLAMP is well protected against corrosive deterioration. This connection is made fast and, furthermore, it is maintenance-free. There is no need for costly periodical examination of the connections.

The supply modules of the WAGO I/O system are partly equipped with a fuse holder. This fuse holder can be pulled out in order to break the circuit of the following modules. To do so, you first have to insert a screwdriver into one of the slots on both sides in order to pull out the front side of the fuse holder.
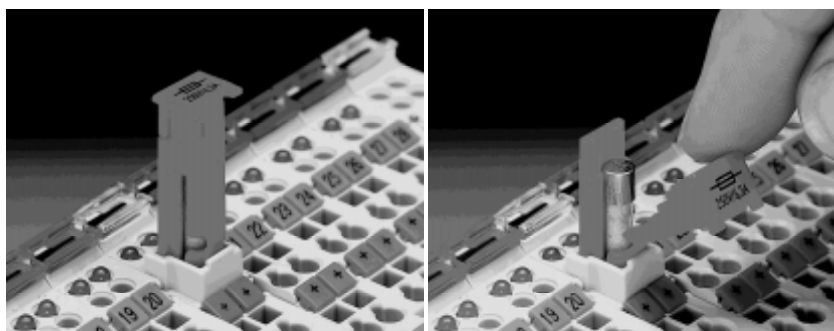
The front side now being hinged down makes it possible to remove or to insert the fuse. After that, you lift up the front side again and push the fuse holder back into its original position.

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2   Buscoupler - INTERBUS S

2.1   Buscoupler - Hardware
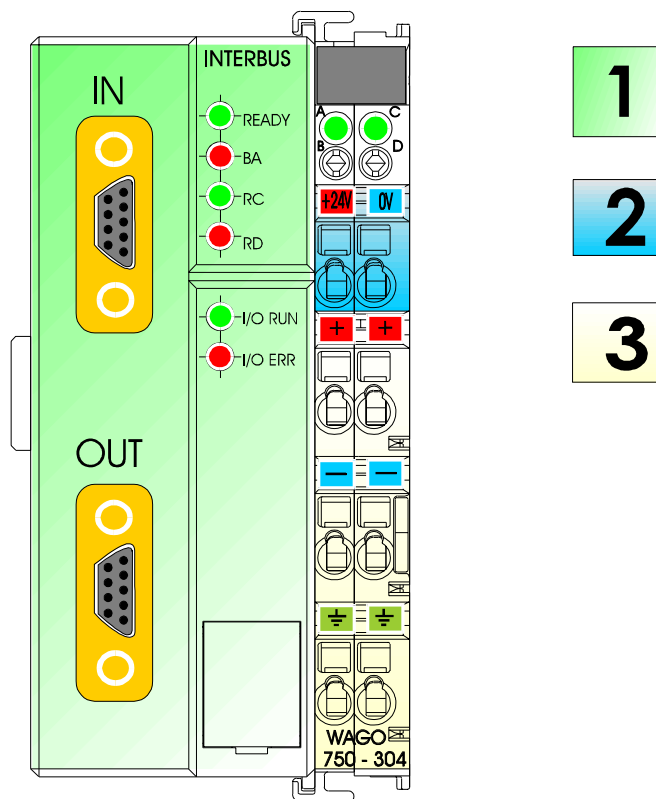
Ill. 2: The INTERBUS buscoupler

The 750-304 Interbus coupler consists of two major electronic sub systems:

left side:
This housing contains the electronics for the coupling to the bus, the processor
and the fieldbus connection. (ill. 2.1)

right side:
This housing contains the DC to DC converter and power distribution for the internal K
bus, local processor and external 24 V DC connections to other discrete I/O modules.
Illustration 2.2 identifies the 24 V DC connection points to supply voltage to I/O
modules. Illustration 2.3 identifies the ground connection.

2.2   Supply Voltage - Electronics
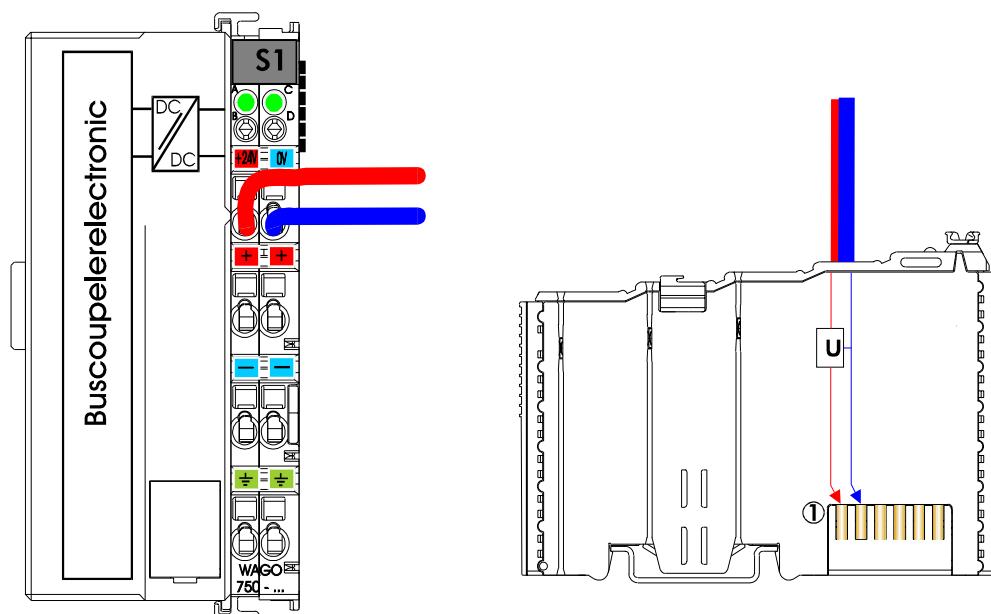
Ill. 3: Termination points for the power supply and the internal electronics

The nominal operating voltage of the Buscoupler and the control electronics in the function modules is 5 V DC. The supply is connected to the first two CAGE CLAMPS at the top of the coupler as seen in Ill. 3.

The 24 V DC supply voltage is generated by an internal voltage regulator (DC/DC converter) and fed to the electronics (5 V DC). The electrical isolation of the external bus system is made by utilizing an optocoupler.

Please note that the power supply for the control electronics in the function modules is made automatically by the data contacts of the following module when it is snapped on the assembly (ill. 3.1). The power supply   to the attached I/O modules is provided by gold-plated self-cleaning slide contacts. I f an attached module is   taken out of the existing configuration, the connection via the K bus is broken and the coupler is able to detect this.

⚠️ **WARNING**
If a module is taken out of the ex   isting configuration, there may be undefined states. You should disconnect the power supply when changing anything in the configuration.

2.3   Supply Voltage - Field Side
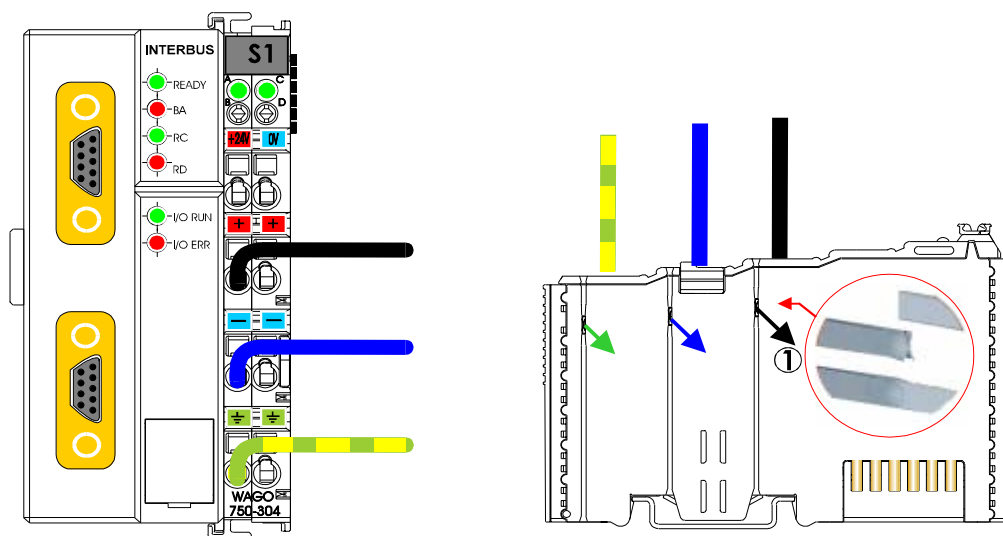
Ill. 4: Termination points for the supply voltage - Field side

The connection of the supply voltage is electrically isolated from the internal electronics. Two CAGE CL AMPS are always connected by a power contact. By this way, the power supply is taken to different points of the configuration.

It is possible to supply the following at the termination points (Ill. 4):

Volts: 24 V DC - Amps: 10 A DC

WARNING!
120 and 230 V AC can only be supplied via modules 750-609, 750-611 and 750-612! The supply modules which are permanently integrated on the buscouplers, can be supplied with 24 V DC only. The current on the power contacts should be max. 10 A.

The voltage is automatically supplied when the function modules are snapped together. Self-cleaning power jumper contacts (P.J.C.s) ensure safe connections (Ill. 4). Female contacts (current supply) are integrated in the buscoupler and I/O housings. The male contacts on the buscoupler and I/O housings supply the voltage to the I/O modules when inserted together from left to right.

The ground (earth) contact makes first and breaks last conforming to electrical standards and can be used as protective grounding.

Depending on the I/O function, some modules do not have P.J.C.s. It is important to note this when assembling a node. Many modules require field side power, many do not. Please review the circuit diagrams of the individual modules. An additional power supply module may be necessary.

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When using the supply module 750-601/602, the field supply from the bus coupler is interrupted. From that point a new power supply connection is necessary to provide DC to any additional I/O modules.

WARNING!
The ground (earth) field side contact should be disconnected when testing the isolation. Otherwise the results could be wrong or even the module could be destroyed.
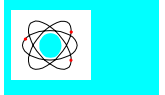
2.4   Bus connection and station (node) address
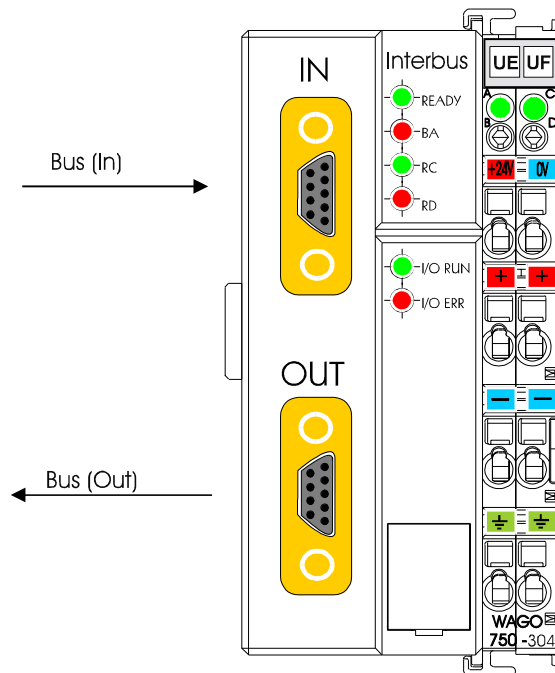
Ill. 5: Bus connection

Fieldbus connection:

The Interbus interface is normally provided by D SUB connection according to US Standard EIA RS485 for data transmission by wires.

Outgoing D-SUB (OUT)	PIN	cable	PIN	Incoming D-SUB (IN)
/DO	6	green	6	/DO
DO	1	yellow	1	DO
/DI	7	pink	7	/DI
DI	2	gray	2	DI
COM	3	brown	3	COM
	5	commoning wire		
	9	commoning wire		

Table 1: Wire connection Interbus S

The connection point of the D SUB connector is lowered in such a way that after a connector is installed placement in an 80mm high switchbox is possible.

Configuration Interface

The configuration interface used for the communication with
WAGO-I/O-CHECK or for firmware upload is located behind the cover flap.
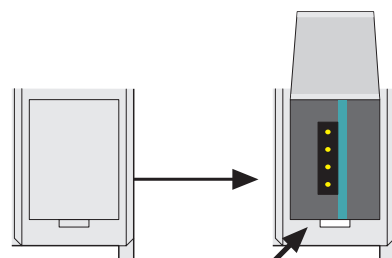
Configuration interface

Fig. X-1: Configuration interface   g01xx06e

The communication cable (750-920) is connected to the 4-pole header.

⚠ **Warning**
The communication cable 750-920 must not be connected or disconnected
while the coupler/controller is powered on!

3 The Enclosure and Specifications
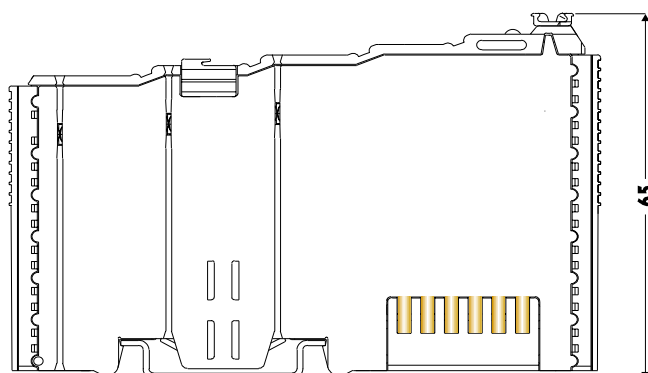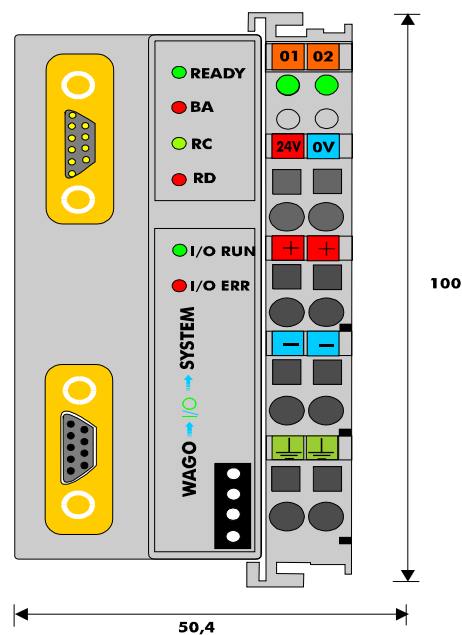
SYSTEM DATA:

	750-304	750-324
Number of function modules	256	on request
Number of I/O points	4096	on request
Transmission medium	shielded Cu-cable (5 x 0.25 mm²)	
max. bus length	400 m	
Baud rate	500 kBaud	

TECHNICAL DATA:

	750-304 dig.+analog	750-324 digital
Number of function modules	64	32
Digital peripheral signals	256	64
Analog peripheral signals	32	---
Configuration possibility	via PC or control	---
Bus connection	2 D-SUB with protection against vibration	
Voltage supply	24V DC (-15%/+20%)	
Input current	105 mA typ; 900 mA max.	85 mA typ.; 500 mA max.
Internal current	400 mA	400 mA
Power jumper contacts	blade / spring contact slide contact, self-cleaning	
Maximum current supplied to K-Bus for internal module use	1.75 A	on request
Voltage power jumper contacts	24 V DC	
Current power jumper contacts	10A DC	
Data contacts	slide contacts, 1.5 u hard gold-plated self-cleaning	
Voltage drop via data contacts	<1V with 64 wired special function modules	
Housing material	Polycarbonat, Polyamid 6.6	
Marking	standard markers WAGO BR247/248 marker cards 8 x 47mm	
Wire connection	CAGE CLAMP; 0.08mm^2 -2.5mm^2 /AWG 28 -14	
Mounting position	any position	
Type of protection	IP 20	
Isolation	500 V system / power supply	
Operating temperature	0°C...+55°C	
Dimensions (mm) W x H x L	51 x 65* x 100 (*from upper edge of the carrier rail)	

Interbus S buscoupler with extended diagnostics 750-304/000-001

The Interbus S buscoupler with no. 750-304/000-001 has the possibility of extented diagnostic functions. The technical data is the same as 750-304.
Different from the standard buscoupler, a word for diag nostic messages is put into the input data process image and a word for the control of the diag nostic input is put into the output data process image.
The maximum number of input and output modules is reduced by the additional diagnostic function because Interbus S transmits only 31 words of a process image.

Order of the diagnostic status word:

Bit of the status word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
		error	error code (s. table)						Channel		Module					

The error code is shown in the following table:

Error code	Description
0	unknown fault
5	defective fuse
10	broken wire
15	short circuit

Channel: This is the location for the fault input of a module. The counting is done in the same way as numbering channels.
Module: This is the number of the module. Counting starts at the fieldbus coupler. The first module attached to the coupler is module 0.

The diagnostic control word is for diagnostic actions. E.g. error messages can be cleared in this way.

Order of the diagnostic control word:

Bit of the control word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
		Actions														

The actions are coded as follows:

Actions	Description
0x00 (0)	no action
0x01 (1)	Acknowledge diagnostic control word
0x80 (128)	Clears all error messages in the buffer

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4   INTERBUS S

The Interbus S system (DIN 19245 part 1.2) is set up as a data ring with a central master slave access procedure. All modules are understood as one logical module. Each partner receives data at its input and sends it to the next partner at its output. There is no addressing with a data frame because each partner knows by special control signals (CLOCK, RESET, SELECT, CONTROL) where it is placed in the ring. So there is no bus address. „Addressing" is done via the physical place in the system.

Interbus S has the structure of a spatially distributed shift register. Each cycle is input and output at the same time. While the master gives output data to the shift register, it gets input data from the other end of the ring.

Each part of Interbus S has an ID register. This register keeps information about the type of module, the number of I/O registers and the status and error information.

Interbus S has two general operating modes:

1) ID cycle
The interface module of all devices connected to the bus system reads out the ID register in the ID cycle and builds up the process image with the aid of this information. The cycle serves as an initialization and is carried out on request.

2) Data cycle
Within the data cycle all input data from the registers is transferred from all devices into the master card (Host Controller) and all output data from the master card (Host controller) to the devices.

4.1 Master Cards (Scanners, Host Controllers)

The operation of the master is carried out in most cases via a central controller like a PLC, PC or NC. Connection to the remote stations is made via master cards.

Common master modules are:

- Phoenix IBS S5 DCB/I-T

- Phoenix IBS S5 DSC/I-T

- Phoenix 100 CB-T

- Hilscher CIF 30 (via Synergetic Micro Systems in USA)

4.2 Configuration software

In order to make the connection between a PLC or PC and the remote stations, the master cards must be configured with the individual station data.

For this, the following software packages are available. For example, the following are available from Phoenix:

- IBS SYS SWT

- IBS CMD SWT

5 Configuration of the fieldbus node in the master

5.1 Identification Code

In the ID cycle which is carried out for the initialization of the Interbus system, the users connected users are identified by their function and their byte length. The Interbus S coupler identifies its length after being started in the initialization phase of the bus modules and forms a corresponding ID code. To this effect each slave has an implemented identification register (ID register) comprising 2 bytes.

A 2 byte wide data unit is called a word. It enables the encoding of 65536 different states. In Interbus S, different types of users and data widths are called for the coding. This enables the master to find out what type the device belongs to, which means for example, recognizing either frequency inverters or I/O units, like the **WAGO➡I/O➡SYSTEM.** In Interbus S the manufacturers of device types are not recognized. The structure of the ID code is explained below as well as the significance of the individual bits of the ID code.

The length information can be coded from 0 to 32 words:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

messages

data width

class of user

type of user

data direction I, O, I/O
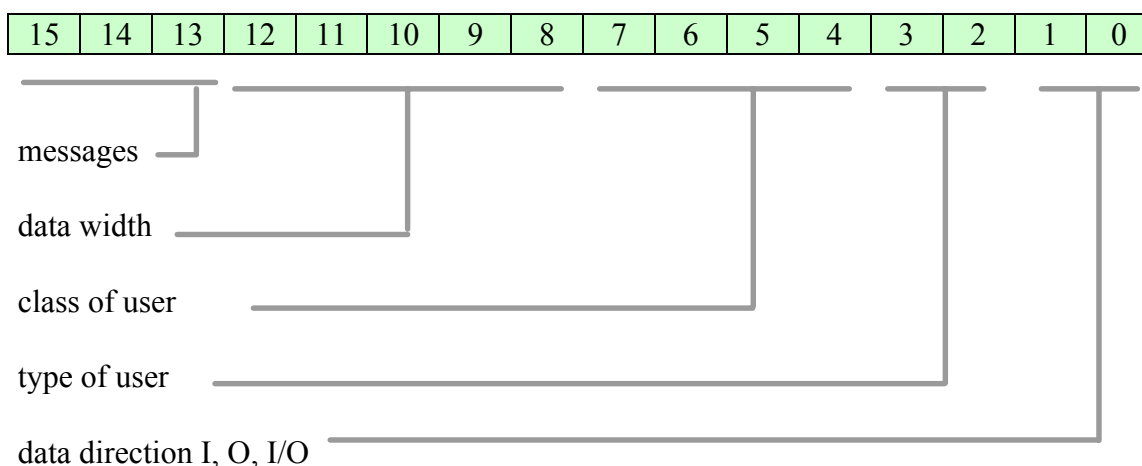
Table 2: Structure of the Interbus ID code

-In the ID registers, the device group is coded in the lowest value (L SB) 8 bits (ID 0 to 7).
-In the following 5 bits (ID 8 to 12), the data width is coded. The 3 bits with the highest value (MSB) (ID 13 to 15) are used for management functions. Via these bits, dynamic fault messages are transferred during operation. These bits are not defined by the hardware.

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5.2   ID Code for WAGO I/O System

Due to the combined use of digital, analog and special functions on one fieldbus station and with the given structure of the Interbus ID codes, it is impossible to manage with one ID code.

The WAGO Interbus S buscoupler is identified as a digital slave with variable length!

ID-Code dec, hex	Digital Outputs	Digital Inputs	Analog Outputs	Analog Inputs
1, 0x1	x			
2, 0x2		x		
3, 0x3	x	x		
49, 0x31	-		x	
50, 0x32		-		x
51, 0x33	-	-	x	x

[x]: ID code given   []: is not possible   [-]: when mixed with digital

Table 3: ID codes for the WAGO Interbus S buscoupler

For the master, it is important to know how many data registers each user assigns in the Interbus S system. If a user has, for example, 16 bits of input and 32 bits of output, he assigns 2 words in the bus because there are 2 words of output. In this case the higher value of data width is decisive. The data width is coded by the bits ID 8 to ID 12 as shown in section 5.1.

The following table shows the register widths depending on the function modules connected to a WAGO Interbus S buscoupler.

Possible values for data length are::

Data length	Buscoupler	Remarks
0 Words	x	
1 Nibble		Busmaster supports only Generation 4.
1 Byte		Starting with SPS-Firmware 3.20 or PC-driver 2.0
3 Nibble		Busmaster supports only Generation 4
1 Word	x	
3 Nibble		Busmaster supports only Generation 4
3 Byte		Starting with SPS-Firmware 3.20 or PC-driver 2.0
2 Words	x	
5 Nibble		Busmaster supports only Generation 4
5 Byte		Starting with SPS-Firmware 3.20 or PC-driver 2.0
3 Words	x	
4 Words	x	
5 Words	x	
6 Words	x, ab WF	Starting with SPS-Firmware 3.20 or PC-driver 2.0
7 Words	x, ab WF	Starting with SPS-Firmware 3.20 or PC-driver 2.0
8 Words	x	
9 Words	x	
10 Words	xx	Starting with SPS-Firmware 3.20 or PC-driver 2.0
12 Words	xx	Starting with SPS-Firmware 3.20 or PC-driver 2.0
14 Words	xx	Starting with SPS-Firmware 3.20 or PC-driver 2.0
16 Words	xx	Starting with SPS-Firmware 3.20 or PC-driver 2.0
24 Words	xx	Starting with SPS-Firmware 3.20 or PC-driver 2.0
32 Words	xx	Starting with SPS-Firmware 3.20 or PC-driver 2.0

[x]: is used [xx]: is used and firmware 3.20 or PC driver 2.0 or later is combined

5.3 IBS CMD configuration software

In the following chapter the configuration package IBS CMD configuration software is presented in short form. This procedure facilitates operation of the WAGO Interbus buscoupler.

Further and specific information is given in the respective operating instructions of the different software packages.

5.3.1 CMD Software Package

Please pay attention that the corresponding *interfacing* and the function *extended* should be selected.

The following menu is obtained via the key OK and the password allocated at the program installation.
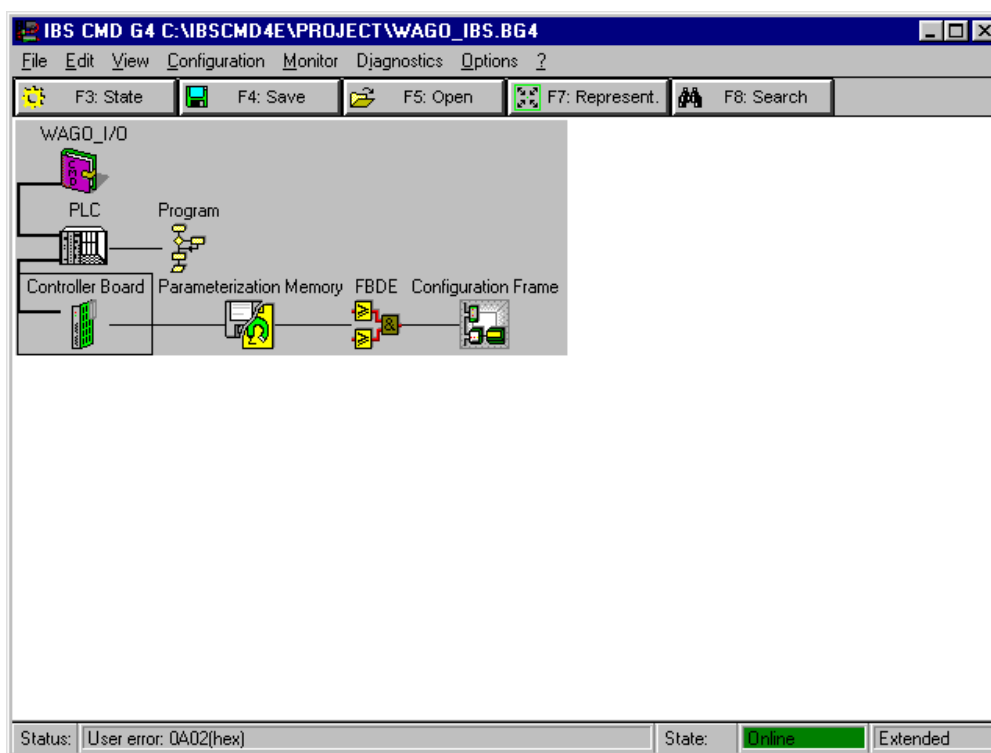
Ill. 10: First menu configuration

This is the first menu for further configuration. From this point the configuration can be made automatically or manually.

1) Automatic configuration
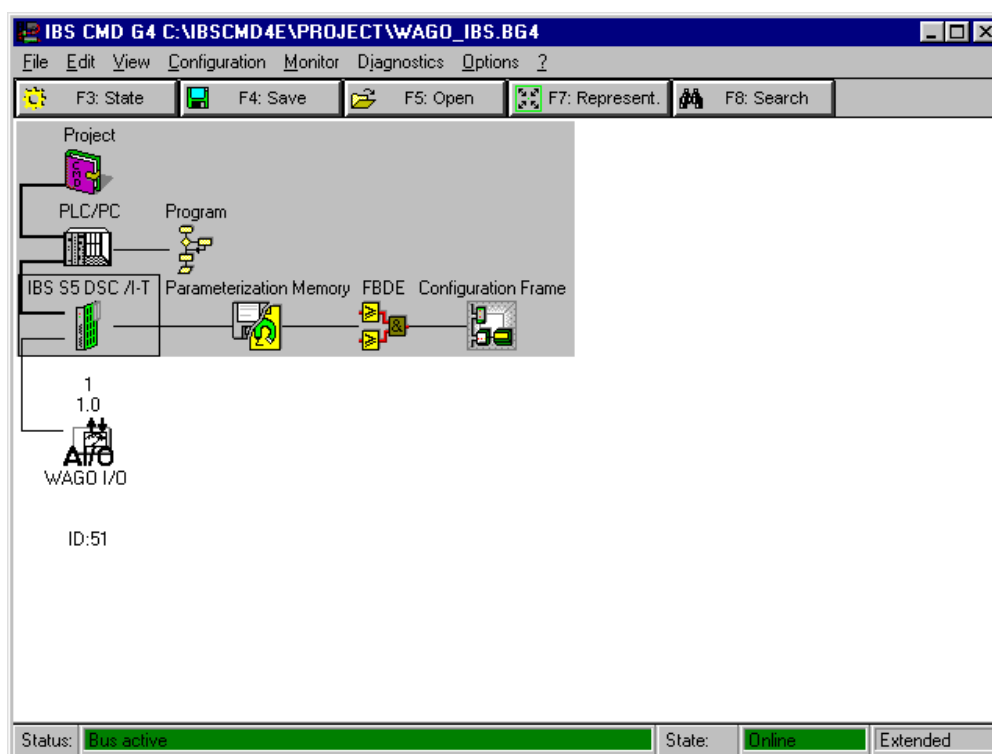
Ill. 11: Automatic configuration

If the complete fieldbus system with all stations and the master interface is operational, automatic configuration of the connected stations can be called up via the menu „bus structure". Then the communications are started automatically and the configuration is determined and set.

2) Ident code
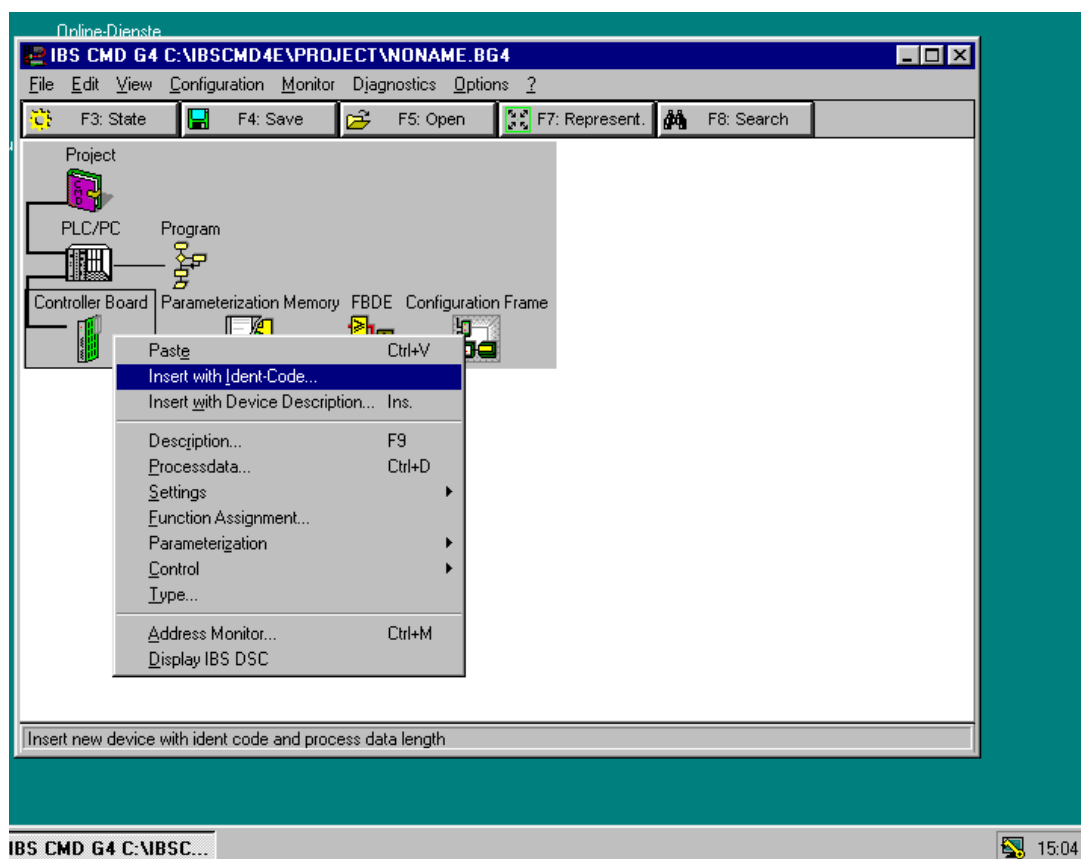
Ill. 12: Insertion of the WAGO I/O System via the Ident code

For manual configuration, the menu item „ bus structure" in the config uration screen must be selected. You will then see Ill. 12.

The corresponding ID code of table 3 and the length of the process data channel must be indicated in the selected submenu. The length is dependent on the module with the largest data length.

WAGO→I/O→SYSTEM
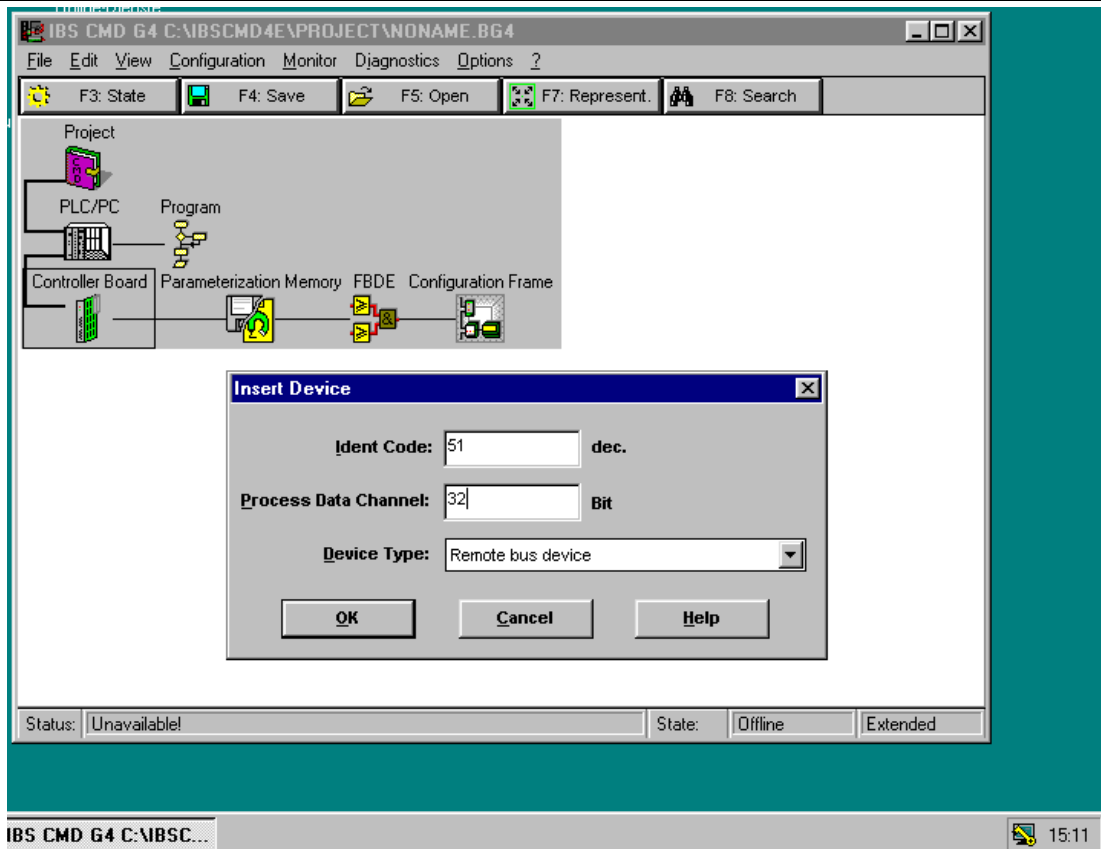
Ill. 13: Insertion of the ID code and the data length

With the finalization of the entries via the key OK, a menu for the definition of the user will appear.

WAGO→I/O→SYSTEM

Insert Device Description ☒

Device Description

Device Number: `1.0`

Group Number: `        `

Interface type ...

Icon ...

Parameter Channel ...

Station Name: `Station 1`

Device Name: `device 1.1`

Manufacturer name: `WAGO`

Device Type: `I/O 2AE 2AA 4DA 4DE`

Profile Number: `0`   hex.

Ident Code: `51`   dec.

Process Data Channel: `32`   Bit

Parameter Channel: `0`   Bit

☐ Gray out device

OK   Cancel   Help

Ill. 14: Description of user

After all data has been entered and stored via OK, the station created with the WAGO Interbus coupler is then integrated into the fieldbus system being set up.

This station is displayed via the bus structure that has now been integrated:
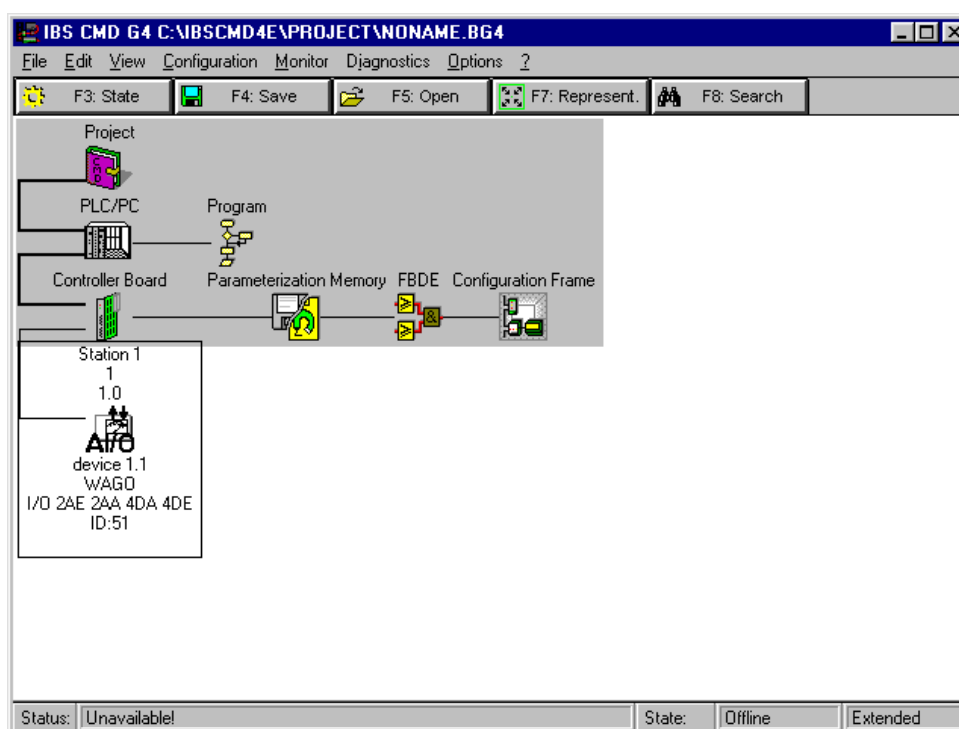
5.4   Example of an application
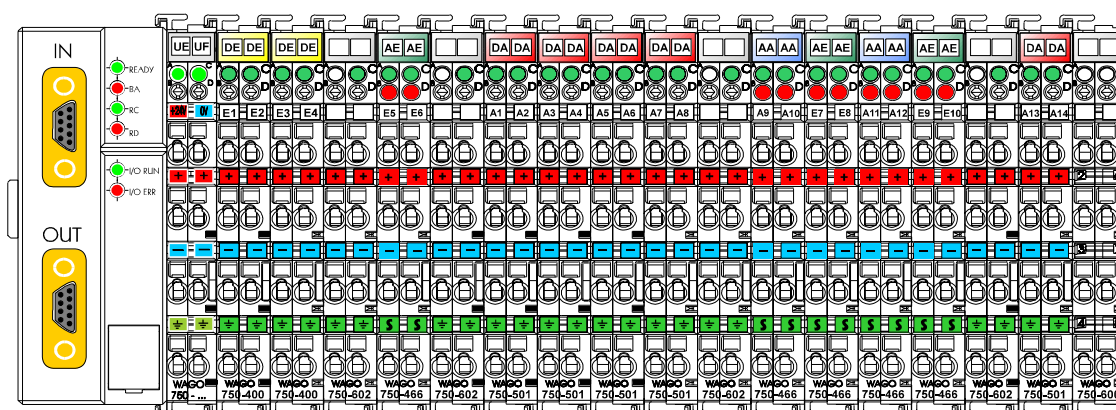
Ill. 19: Example of an application

The Interbus S station is composed as follows:

Function module	Process image inputs	Process image outputs
1; Digital input	PI 32.0	
1; Digital Input	PI 32.1	
2; Digital Input	PI 32.2	
2; Digital Input	PI 32.3	
3; Voltage supply	------	------
4; Analog Input	PI 20	
4; Analog Input	PI 22	
5; Voltage supply	------	------
6; Digital Output		PI28.0
6; Digital Output		PI28.1
7; Digital Output		PI28.2
7; Digital Output		PI28.3
8; Digital Output		PI28.4
8; Digital Output		PI28.5
9; Digital Output		PI28.6
9; Digital Output		PI28.7
10; Voltage supply	------	------
11; Analog Output		PI 20
11; Analog Output		PI 22
12; Analog Input	PI 24	
12; Analog Input	PI 26	
13; Analog Output		PI 24
13; Analog Output		PI 26
14; Analog Input	PI 28	
14; Analog Input	PI 30	
15; Voltage supply	------	------
16; Digital Output		PI29.0
16; Digital Output		PI29.1
17; End module	------	------

Table 5: Assignment of the process image

WAGO→I/O→SYSTEM

The addresses indicated in the table results from the master configuration started in the basic address. By the internal structure of the Interbus coupler, the process image is divided as follows:

Output data

O_0
....
.....word orientated data
....
O_x
O_{x+1} bit orientated data
O_{x+y}

Input data

I_0
....
....word orientated data
....
I_x
I_{x+1} bit orientated data
I_{x+y}

Due to this division, the first addresses allocated in the configuration are reserved for the analog inputs and outputs. The counting direction is from left to right and starts with the first analog channel next to the bus coupler.

Process data

	Device Name	ID	D.-No.	Process Data Name	I/O	Lngth.	Byte	Bit	Assignments
1		51	1.0	48-Bit_Input_1	I	48	0	0	P0
2		51	1.0	16-Bit_Input_1	I	16	0	0	P0
3		51	1.0	32-Bit_Input_1	I	32	2	0	P2
4		51	1.0	48-Bit_Output_1	O	48	0	0	P0
5		51	1.0	16-Bit_Output_1	O	16	0	0	P0
6		51	1.0	32-Bit_Output_1	O	32	2	0	P0

Standard device data: Input = 48 Bit, Output = 48 Bit

Filter...   ☐ Filtered   Assignment...   ☑ Multiple Addressing   Autom. Assign...

Ok   Cancel   Help

Ill. 21: Definition inputs/outputs

6   Buscoupler startup and troubleshooting

After configuration of the master connection and electrical installation of the fieldbus node/station, operation of the system can begin.

After power to the B uscoupler and I /O modules has been applied, the B uscoupler verifies all internal functions, components and the communication interface by an internal diagnostic routine. Then the function modules and the existing configuration is determined. At the same time a hidden file is stored. It consists of an input and an output area which is located on the fieldbus RAM of the log chip. During the power up phase the 'I/O ERR' LED flashes with an increased frequency. After a faultless power up the fieldbus coupler enters the state 'fieldbus start'. The g reen LED 'RUN' indicates that the Bus is operating normally.

In case of a fault the red 'I/O ERR' LED will continue flashing.

By counting the number and frequency of flashes the fault can be easily identified quickly and accurately. A varying number of flashes and frequencies defines the fault. The table below describes the fault condition based on the counted number of 'I/O ERR' LED flashes.

2. Blinking sequence	3. Blinking sequence	description
error code	error argument	
1	0	
	1	overflow of internal buffer for inline code
	2	unknown data type
2	0	error in programmed process image
	N (N>0)	error in comparison of tables: module N (programmed configuration), passive modules like supply terminal blocks do not count
3	0	modules have identified error in fieldbus commands
4	0	data error on fieldbus or fieldbus break at the coupler
4	N (N>0)	fieldbus break after module N
5	N	filedbus error in register communications with module N
6		error in INTERBUS-S configuration telegram
	0	too lillte configuration data
	N (0<N<65)	error in 1st configuration byte

Table 5: Diagnosis LEDs - on buscoupler

After elimination of the fault, the buscoupler can only be set to the normal working condition by another POWER ON sequence.

The green I/O LED flashes when accessing the I/O modules internal data channels.

After being switched on, the buscoupler queries the configuration of the bus modules but does not carry out a data exchange with the I/O modules. This means that the red I/O LED will extinguish after a faultless startup. The green I/O LED will indicate when data is being exchanged by the Interbus network.

Status and error diagnostics:

The fieldbus LEDs show the state of the bus system. The functions of Interbus S are shown by the LEDs „READY", „BA", „RC" and „RD".

READY	BA	RC	RD	Meaning	Help
on	off	off	off	Buscoupler ready	
on	on	off	off	Fieldbus active; data exchange	
on	off	on	off	incoming connection established	
on	off	off	on	Field bus off error in cable or master	search error in cable or master
off	off	off	off	no function ; no voltage	

Table 7: Diagnostic LEDs - fieldbus

WAGO➡I/O➡SYSTEM

7 General conditions

This chapter describes the general conditions for error-free running of the
WAGO➡I/O➡SYSTEM

7.1 Transporting and storing conditions

The following declarations concern modules which are transported and stored in the
original package.

Condition	allowed values
Free fall	≤ 1m
Temperature	-40° to +70° C
Relative humidity	5 to 95% (without condensation)

7.2 Mechanical and climatic conditions

The modules of the **WAGO➡I/O➡SYSTEM** are not allowed to be operated without
taking suitable actions
- in places with strong conditions e.g. very dusty rooms or corroding atmosphere
- in place with high concentrations of ionisation

The temperature should be in a range between 0° C and +55° C. The relative humidity
should be in a range of 5 to 95% (without condensation).
The modules should be placed horizontal for better heat dissipation.

The concentration of SO_2 must be below 25 ppm with a relative humidity of < 75%. The
concentration of H_2S must be below 10 ppm with the same humidity.

The mechanical conditions are given as sinusoidal oscillations.

Frequency range (Hz)	continuous	sometimes
10 ≤ f < 57	0.0375 mm amplitude	0.075mm amplitude
57 ≤ f ≤ 150	0.5 g constant acceleration	1 g constant acceleration

For stronger impulses and oscillations, the acceleration and the amplitude should be
reduced by suitable actions. The following table shows the type of test for the
mechanical conditions.

Test for	Test sequence	Remarks
Oscillations	Test for oscillations IEC 68, part 2-6	Type of oscillation: sweep with a rate of change of 1 octave per minute $10 \text{ Hz} \leq f < 57 \text{ Hz}$, const. amplitude 0,075mm $57 \text{ Hz} \leq f \leq 150 \text{ Hz}$, const. acceleration 1 g period of oscillation: 10 sweep per axis in each of the 3 vertical axes
Impulse	Test for impulses IEC 68, part 2-27	Type of impulse: half sinusoidal Intensity of impulses: 15 g peak value, 11 ms maintenance time route of impulses: 2 impulses in each of the 3 vertical axes

7.3   Class of protection and degree of protection

The class of protection is IP2X (IEC 529), i.e. protection against touch with a standard test object. There is also protection against solid bodies greater than 12 mm. There is no special protection against water.

WAGO➡I/O➡SYSTEM

7.4   Electromagnetic compatibility

Method of measurement	Disturbance
Interference with narrow-band conducted disturbance	EN 50082-2, A
Interference with impulse groups	EN 50082-2, B
Discharge of static electricity	EN 50082-2, B
Interference with electromagnetic fields	EN 50082-2, A
Interference field strength	EN 55011

These requests for electromagnetic compatibility are fulfilled by all modules of
WAGO I/O SYSTEM (except for 750-630 and 750-631).

7.5   Power supply

If non-stabilized power supply is used for the supply of the buscoupler, it must be
stabilized by a capacity (200 µF per 1 A load current).
For the **WAGO I/O SYSTEM** a filter module has been developed (288-824).
This module serves as a filter module for non-stabilized 24 V DC power supplies if the
specified voltage deviation is not met.
Reasons for the deviations may be voltage jumps in the primary circuit, overloads in the
secondary circuit or the switching of undampened inductances and capacitances.

7.6   Certificates

The modules of **WAGO I/O SYSTEM** have passed the conformance test of UL .
Look for listing mark on product.
The Profibus coupler 750-301 and 750-303 are certified of PNO with Z   00241 and
Z00242.
The Interbus coupler 750-304 has passed the relevant tests in accordance with the
Interbus conformance requirements (number 111).
The DeviceNet coupler 750-306 has succesfully passed through the conformance test of
Open DeviceNet Vendors Association Europe.

Digital Inputs (24 V AC/DC, 120 V AC, 230 V AC, 48 V DC) PN: 750-400...415
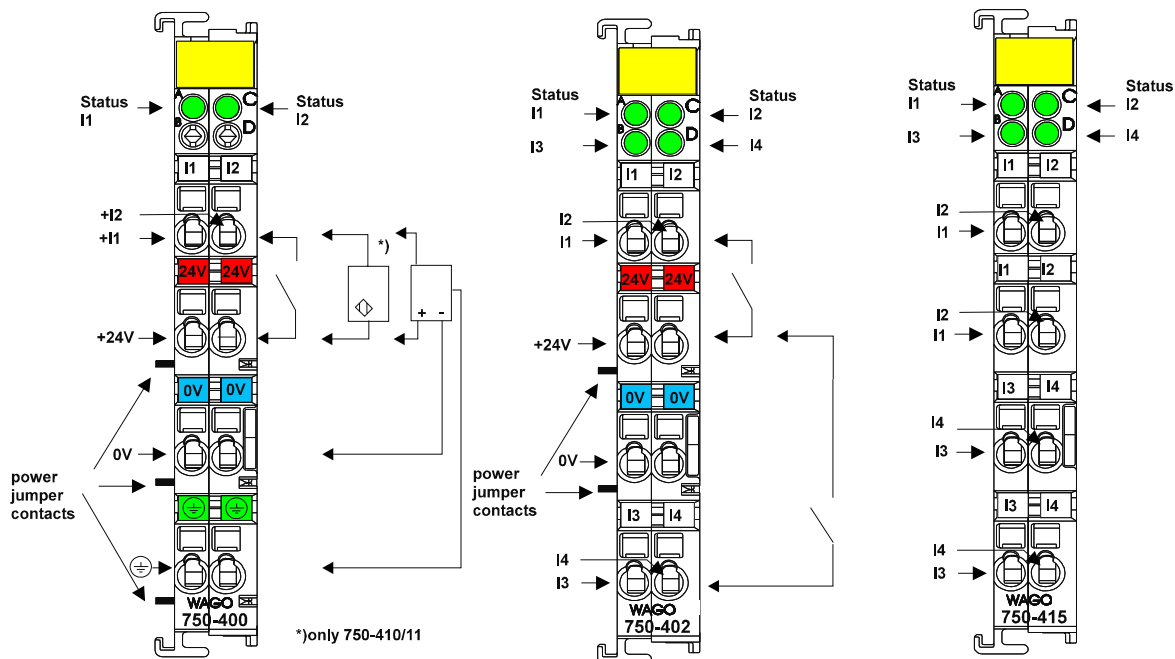
Technical description

The supply is applied by a series-connected termination to each I/O module for the respective operating voltage. Power connections are made automatically from module to module when snapped onto the DIN rail.

Attention:

The lowest power jumper contact is not carried out for some modules (e.g. 4-channel)! A module which needs all contacts (e.g. 2 channel digital) may not be connected to the right hand side of modules which do not have 3 power jumper contacts (e.g. 4 channel modules).

All 2-channel digital inputs are 4-conductor devices allowing the direct connection of 4-conductor sensors with the terminations V+, 0V, ground and signal.

The 4-channel digital inputs are suitable for the direct connection of two 3-conductor sensors (V+, 0V, signal). The power distribution module 750-614 is available for the connection of more sensors to V+ and 0V.

The modules 750-408 and 750-409 are low-side switching.

A 2-wire proximity switch can be connected to the modules 750-410 and 750-411.

RC filters are series-connected to the 5, 24 and 48 V versions for noise rejection and switch debouncing. They are available with time constants of 3.0 ms and 0.2 ms.

The standard numerical assignment for bus operations is from left to right, starting with the LSB. The positions of the different I/O modules in the configured node/station are selectable by the user. A block type configuration is not necessary.

The Input module can be connected to all buscouplers of the WAGO→I/O→SYSTEM.

Technical Data:

Item Number 750-	400	401	402	403
Number of inputs	2		4	
Input filter	3 ms	0.2 ms	3 ms	0.2 ms
Nominal voltage	24V DC (-15%/+20%)			
Signal voltage (0)	-3V...+5V DC (std. EN 61131 Typ 1)			
Signal voltage (1)	15V...30V DC (std. EN 61131 Typ 1)			
Input current (internal)	2.5 mA max.		5 mA max.	
Input current (field side)	5 mA typ.			
Isolation	500 V system/power supply			
Internal bit width	2		4	
Configuration	no address or configutation adjustment			
Operating temperature	0°C....+55°C			
Wire connection	CAGE CLAMP; 0.08 to 2.5mm^2			
Dimensions (mm) WxHxL	12 x 64* x 100 (*from upper edge of carrier rail)			

Item Number 750-	405	406	410*	411*
Number of inputs	2		2	
Input filter	10 ms		3 ms	0.2 ms
Nominal voltage	230 V AC (-15%/+10%)	120 V AC (-15%/+10%)	24V DC (-15%/+20%))	
Signal voltage (0)	0 V...40 V AC	0 V..20 V AC	-3 V ... +5 V DC (std. EN 61131 Type 2)	
Signal voltage (1)	79 V...1.1 U_N AC	79 V...1.1 U_N AC	11 V ... 30 V DC (std. EN 61131 Type 2)	
Input current (internal)	2 mA		2.5 mA max.	
Input current (field side)	6.5 mA typ.	4.5 mA typ.	8 mA typ.	
Isolation	4 kV system/power supply		500 V system/power supply	
Internal bit width	2			
Configuration	no address or configuration adjustment			
Operating temperature	0°C....+55°C			
Wire connection	CAGE CLAMP; 0.08 to 2.5mm^2			
Dimensions (mm)WxHxL	12 x 64* x 100 (*from upper edge of the carrier rail)			

*) 2 - wire proximity switch, current without load max. 2 mA

Digital Inputs 750-400...415   2

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Item Number 750-	408	409	412	413
Number of inputs	4		2	
Input filter	3 ms	0,2 ms	3 ms	0,2 ms
Nominal voltage	24V DC (-15% / +20%)		48 V DC (-15% / +20%)	
Signal voltage (0)	15 V...30 V DC		-6 V ... +10 V DC	
Signal voltage (1)	-3 V...5 V DC		34 V ... 60 V DC	
Input current (internal)	10 mA max.		5 mA max.	
Input current (field side)	3.5 mA typ.			
Isolation	500 V system/power supply			
Internal bit width	4		2	
Configuration	no address or configuration adjustment			
Operating temperature	0°C....+55°C			
Wire connection	CAGE CLAMP; 0,08 to 2,5 mm^2			
Dimensions (mm)WxHxL	12 x 64* x 100 (*from upper edge of the carrier rail)			

Item Number 750-	414	415
Number of inputs	4	4
Input filter / Conversion time	0.2 ms	20 ms
Nominal voltage	5 V DC	24 V AC/DC (-15%/+20%)
Signal voltage (0)	0...0.8 V DC	-3...+5 V DC 0...+5 V AC
Signal voltage (1)	2.4 V...5 V DC	11 ... 30 V DC 10 ... 27 V AC
Input current (internal)	5 mA	10 mA
Input current (field side)	50 μA typ.	7.5 mA DC 7.6 9.5 mA AC
Isolation	500 V system/power supply	500V system/power supply 50 V channel/channel
Internal bit width	4	4
Configuration	no address or configuration adjustment	
Operating temperature	0°C....+55°C	
Wire connection	CAGE CLAMP; 0,08 to 2,5 mm^2	
Dimensions (mm)WxHxL	12 x 64* x 100 (*from upper edge of the carrier rail)	

Counter modules
PN 750-404, 750-404/000-001, 750-404/000-002
750-404/000-003, 750-404/000-004
Up/Down Counter 100 kHz, 750-404

Status U/D̄ →
Status O1 →
Status CLOCK ←
Status O2 ←

A C
B D

V/R̄   Clk

Clock
U/D̄ →

24V →

power jumper
contacts →

0V →

O1 O2

O1 →   ← O2

WAGO
750-404
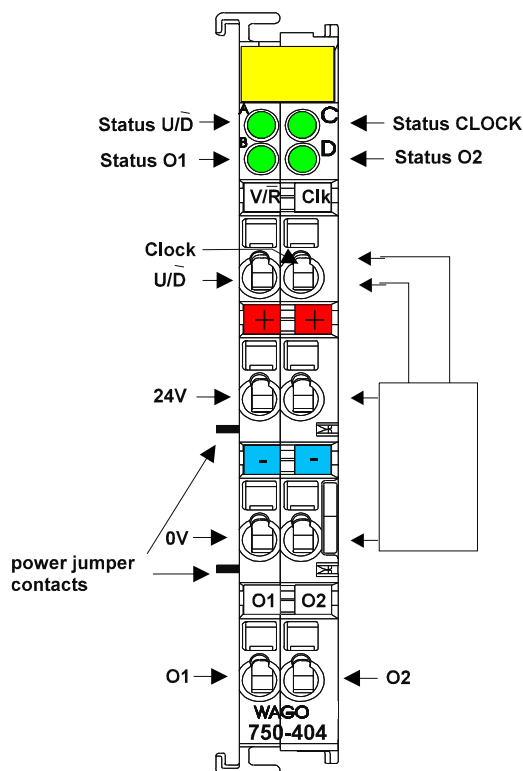
Technical Description:

⚠ Attention! The description that is in the I/O ring binder data pages (88-530/013-600 dated 7/96) is not correct. The bottom contacts are additional outputs.

⚠ **Attention:**
The lowest power jumper contact is not carried out for some modules (e.g. 4-channel)! A module which needs all contacts (e.g. 2 channel digital) may not be connected to the right hand side of modules which do not have 3 power jumper contacts (e.g. 4 channel modules).

The described configuration is counter with up/down input.

The following description is preliminary and is applicable to the factory configuration.

The counter module is able to run with all WAGO⟹I/O⟹SYSTEM bus-couplers (except for the economy type).

Technical Data:

Item Number: 750-	404, 404/000-001 404/000-004	404/000-002
Number of outputs	2	
Output current	0.5 A	
Number of counter	1	
Input current (internal)	70 mA	
Nominal voltage	24 V DC (-15% +20%)	
Signal voltage (0)	-3V.....+5V DC	
Signal voltage (1)	+15V...+30V DC	
Switching rate	100 kHz	10 kHz max.
Output current	5 mA typ.	
Counter size	32 Bit	
Isolation	500 V system/power supply	
Bit width	32 Bit (8 Bit verification; 8 bit not used)	
Configuration	none, optional with software parameter	
Operating temperature	0°C....+55°C	
Wire connection	CAGE CLAMP; 0.08 to 2.5mm^2	
Size (mm)WxHxD	12 x 64* x 100 (*from upper edge of the carrier rail)	

Organization of the in- and output data:

The counter begins processing with pulses at the CLOCK input. The changes from 0 V to 24 V are counted.

The counter counts up, if the input U/D is set at 24 V. With an open circuit input or 0 V the counter counts backwards.

The two bottom contacts each include another output. These outputs are activated through bits in the control byte.

The control byte has the following bits:

Control Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	x	Set Counter	Block Counter	Output value at output O2	Output value at output O1	x	x

The status byte has the following bits:

Status Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
x	x	Counter is set	Counter is blocked	actual signal at O2	actual signal at O1	actual signal at input U/D	actual signal at input CLOCK

With the control and status-byte the following tasks are possible:

Set the counter: Put Bit 5 into the control byte. The counter with the 32 bit value is loaded into output bytes 0-3. As long as the bits are set, the counter can stop and information is stored. The ensuing data of the counter will be conveyed to the status byte.

Blocking the counter: Bit 4 is set into the control byte, then the count process is suppressed. Bit 4 in the status byte communicates the suppression of the counter.

Set the outputs: Bits 2 and 3 set the additional two outputs of the counter module.

The result of the counter is in binary.

An example:

The counter is set with "Set Counter" to the value 0x0000.0000
- 0X1X.XXXX, 0x00, 0x00, 0x00, 0x00 are carried over as output value
          (carry over the control-byte and the new counter position),
-wait until the input value is 0X1X.XXXX, 0x00, 0x00, 0x00, 0x00
          (the status-byte shows the loading feedback) ,
-carry over 0x00, 0x00, 0x00, 0x00, 0x00 as output value (release counter).
Wait for the first and further counting pulse
-the input value is XX00.XXXX, 0x00, 0x00, 0x00, 0x00 (no counting pulse received)
-the input value is XX00.XXXX, 0x00, 0x00, 0x00, 0x01 (1 counting pulse received)
-the input value is XX00.XXXX, 0x00, 0x00, 0x00, 0x02 (2 counting pulses received)
-.................
-the input value is XX00.XXXX, 0xFF, 0xFF, 0xFF, 0xFF (maximum counting position is reached)
-the input value is XX00.XXXX, 0x00, 0x00, 0x00, 0x00 (a further counting pulse causes an overflow)
-the input value is XX00.XXXX, 0x00, 0x00, 0x00 0x01, (a further counting pulse is received)

Notes: 0x23 is a value in hexadecimal form
          0101.1001 is a value in binary form
          "X" is used if the value at this position is without any significance.

Counter with enable input 750-404/000-001
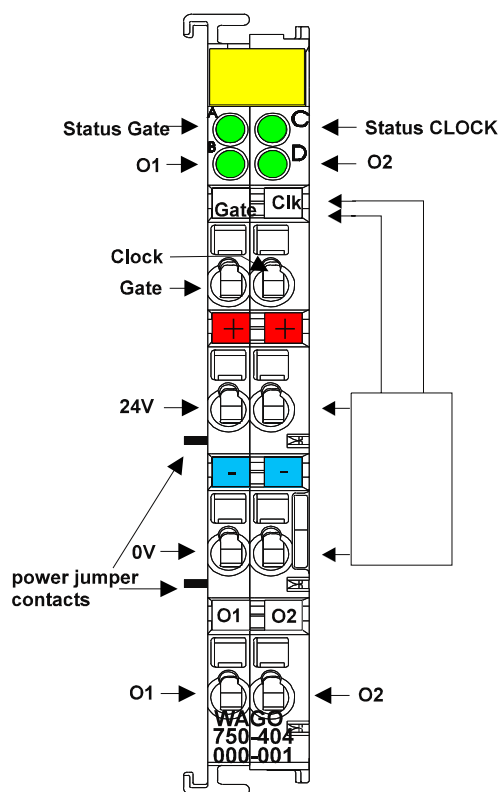
Technical description:

The counter module also can be ordered as counter with enable input (750-404/000-001).

The counter begins processing with pulses at the CLOCK input. The changes from 0 V to 24 V are counted.
The counter counts down if the input U/D is set at 24 V. With an open circuit input or 0 V the counter counts up.

The data format of the module is 4 bytes data and a control/status byte. The module is a 32 Bit counter. The ID Code os 180 (0xB4). The format of input and output data is the same as 750-404.

The counter module is able to run with all WAGO➡I/O➡SYSTEM bus-couplers (except for the economy type).

WAGO⇊I/O⇊SYSTEM

Peak Time Counter 750-404/000-002
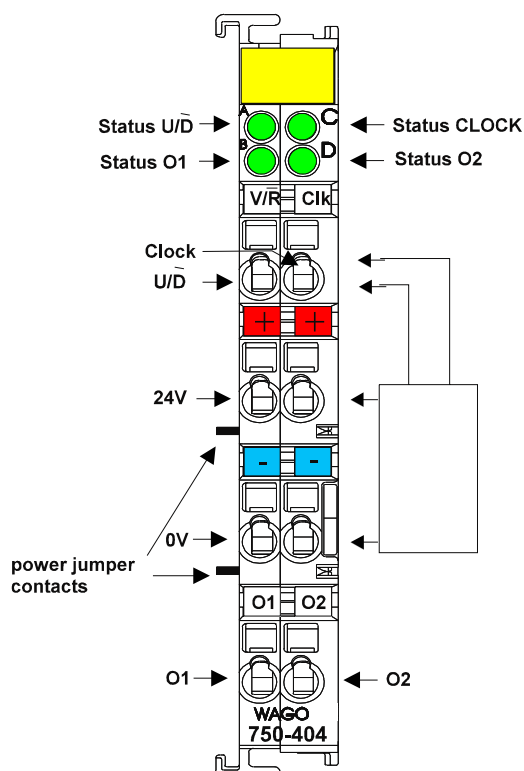
Technical data

The counter module also can be ordered as peak time counter with 750-404/000-002.

This description is only intended for hardware version   X X X X 0 0 0 1- - - -. The serial number can be found on the right side of the module.

The counter begins processing with pulses at the CLOCK input. The changes from 0 V to 24 V are counted.
The counter counts up if the input U/D is set at 24 V. With an open circuit input or 0 V the counter counts backwards.

The two bottom contacts each include another output. These outputs are activated through bits in the control byte.

The counter module is able to run with all WAGO➟I/O➟SYSTEM bus-couplers (except for the economy type).

WAGO⇓I/O⇓SYSTEM

Organization of the in- and output data:

The counter begins processing with pulses at the CLOCK input for a special time span. The time span is predefined as 10 s. The state of the counter is stored in the processs image until the next period. After the recording the counting starts again at 0.

The activation of the counting and the synchronisation with the SPS is made by a handshake in the control and status byte.

The end of thre counting period and thus the new process data is signaled by a toggel bit in the status byte.

The control byte has the following bits:

Control Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	start of the periodic counting	0	Output value at output O2	Output value at output O1	0	0

The status byte has the following bits:

Status Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	counting started	0	actual signal at O2	actual signal at O1	actual signal at input U/D	Toggelbit for end of the record

WAGO⇓I/O⇓SYSTEM

Frequency Counter Module, 750-404/000-003

Status Gate → A C ← Status CLOCK

B D

O1 → O2

G Clk

Clock →

Gate →

+ +

24V →

− −

0V →

power jumper
contacts

O1 O2

O1 → ← O2
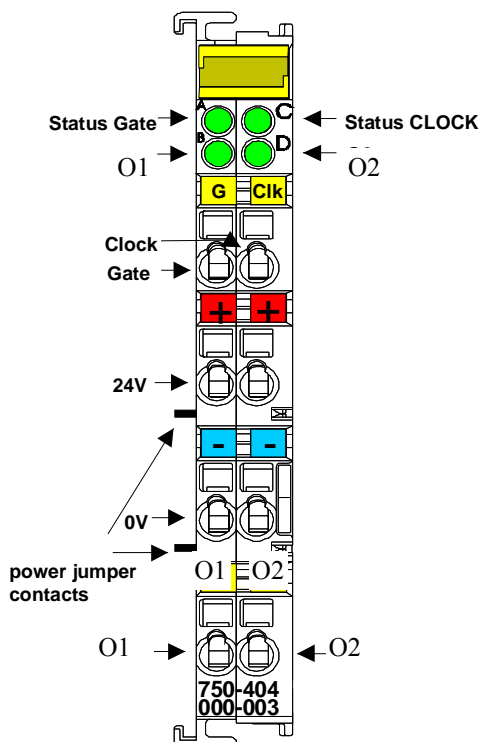
**750-404
000-003**

Technical Description

The counter module 750-404/000-003 measures the period of the 24 V DC input sig nal at the CL OCK terminal and converts it into a   corresponding frequency value. The measurement is enabled if the GATE terminal is an open circuit input or 0V. To disable processing, the GATE input is to be set to 24 V DC.

The terminals O1 and O2 work as binary   outputs. Each output can be activated via specific bits in the CONTROL byte.

The high states of the input and output channels are each indicated by a LED.
To recognize low frequency or near zero frequency signals, the maximum time between two data updates is parameterizable.

Technical Data:

Item-No.: 750-	404/000-003
Supply Voltage	24V DC (-15%/+20%)
Input Voltage (low)	-3V - 5V DC
Input Voltage (high)	15V - 30V DC
Input Current	5mA typ. at 24V DC
Min. Pulse Width	10µs
Output Current	0.5A (short circuit protection)
Voltage Drop	0.6V DC max. at 0.5A
Frequency Range:	
Integration time = 1 period	0.1 - 100Hz, Resolution 0.001Hz
Integration time = 4 periods	1 - 1,000Hz, Resolution 0.01Hz
Integration time = 16 periods	10 - 10,000Hz, Resolution 0.1Hz (1Hz)
Measuring Error:	
Range 0.1 - 100 Hz	$< \pm\, 0.05\%$
Range 1 - 1000Hz	$< \pm\, 0.05\,\%$
Range 10 - 10000Hz	$< \pm\, 0.2\,\%$
Data Format:	
Process Image	5 Byte In- and Output
Internal Bit Width	8 Bit CONTROL/STATUS + 32 Bit DATA
Input Current (internal)	80mA max. at 5V DC
Operating Temperature	0°C....+55°C
Wire Connection	CAGE CLAMP; 0.08 to 2.5mm^2
Size (mm) WxHxD	12 x 64* x 100 (*from upper edge of carrier rail)

Frequency Range:	
Integration time = 1 period	0.1 - 8,000Hz, Resolution 0.001Hz
Integration time = 4 periods	0.25 - 32,000Hz, Resolution 0.01Hz
Integration time = 16 periods	1 - 100,000Hz, Resolution 0.1Hz (1Hz)
Measuring Error:	
Range 0.1 - 8000Hz	$< \pm\, 1\%$
Range 0.25 - 32000Hz	$< \pm\, 1.5\,\%$
Range 1 - 100000Hz	$< \pm\, 1.5\,\%$

Functional description

The counter module acquires the time between one or more rising edges of the CLOCK input signal and calculates the frequency of the applied signal.

The calculation and process imag e update are initiated every 1st, every 4th or every 16th rising edge depending on the integration time selected via the CONTROL byte. The first detection of a rising edge starts the cy clic period measurement and cannot provide a valid frequency value. I n this case the module will send $0x$ $FFFFFFFF_H$ for input information. The same input value is returned when a static hig h or static low signal is applied to the CLOCK input.

If there are no sig nal changes seen at the CL OCK input, the module can be forced to update the process imag e after defined parameterizable time spans. I n this state the module will send the non valid value $0xFFFFFFFF_H$ too.

The following figures illustrate a process data cycle.
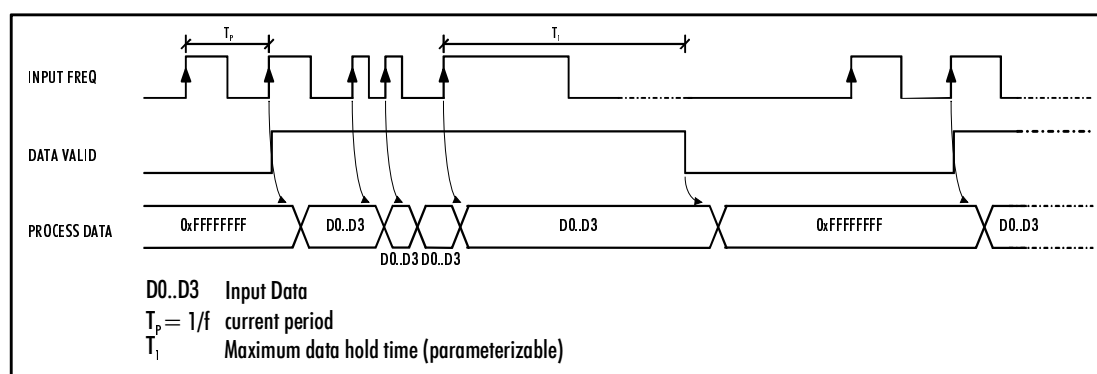
Figure 2: Timing diagram for process data update sequence
(integration time = 1 period)
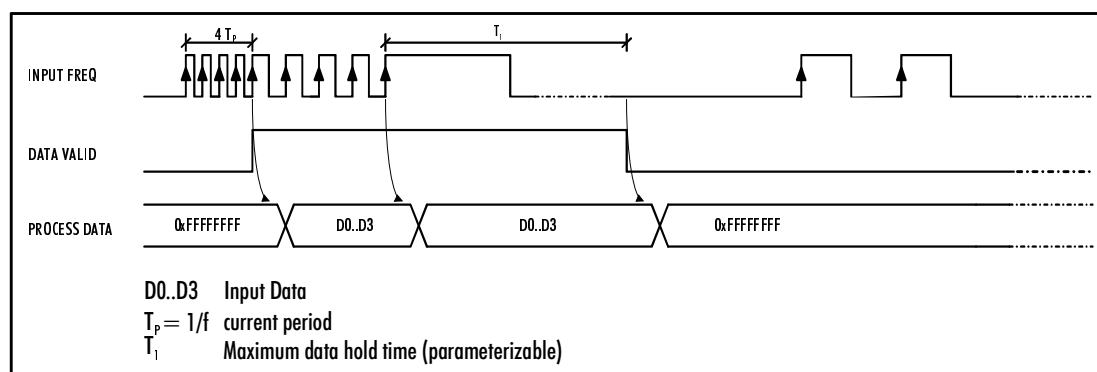
Figure 3: Timing diagram for process data update sequence
(integration time = 4 periods)

Structure of CONTROL and STATUS byte

CONTROL Byte

b7	b6	b5	b4	b3	b2	b1	b0
REG_REQ=0	0	0	T_{VD} REQ	SET_Q2	SET_Q1	RANGE_SEL REQ1	RANGE_SEL REQ0
REG_REQ=1	NRD/WR	REG_A5	REG_A4	REG_A3	REG_A2	REG_A1	REG_A0

Bit	Description
REG_REQ	Access to the register structure is requested, b5...b0 contain the address of the register.
REG_A5...A0	Register address (0-63)
T_{VD} REQ	Request to change the maximum time without valid data
SET_Q2	Control Output Q2 (0: Q2 off, 1: Q2 on)
SET_Q1	Control Output Q1 (0: Q1 off, 1: Q1 on)
RANGE_SEL REQ1	Selection of the integration time and the representation of measured frequency value
RANGE_SEL REQ0	Selection of the integration time and the representation of measured frequency value

STATUS Byte

b7	b6	b5	b4	b3	b2	b1	b0
REG_ACK=0	0	ST_GATE	T_{VD} ACK	ST_Q2	ST_Q1	RANGE_SEL ACK1	RANGE_SEL ACK0
REG_ACK=1	0	REG_A5	REG_A4	REG_A3	REG_A2	REG_A1	REG_A0

Bit	Description
REG_ACK	Acknowledgment to the register request, b5...b0 contain the address of the register.
REG_A5...A0	Register address (0-63)
ST_GATE	State of GATE input (0=enabled, 1=disabled)
T_{VD} ACK	Acknowledgment T_{VD} changed
ST_A2	State of output Q2
ST_A1	State of output Q1
RANGE_SEL ACK1	Acknowledgment to Range Selection, Frequency values are valid
RANGE_SEL ACK0	Acknowledgment to Range Selection, Frequency values are valid

Counter 750-404　　　　11

14.09.98

WAGO I/O SYSTEM

Structure of Input and Output data

The input data contain the CL OCK frequency as a binary value. The representation depends on the RANGE_SEL bits in the CONTROL byte. Even the method of measuring is selected via these bits. The following table illustrates the different modes.

RANGE_SEL1	RANGE_SEL0	Method of measurement	Representation of measuring value
0	0	Integration over 1 period	Frequency in $^1/_{1000}$ Hz
0	1	Integration over 4 periods	Frequency in $^1/_{100}$ Hz
1	0	Integration over 16 periods	Frequency in $^1/_{10}$ Hz
1	1	Integration over 16 periods	Frequency in Hz

Attention:

When a new frequency range is requested, the application has to wait for valid data until the RANGE_SEL ACK bits contain the new frequency range. The maximum delay can be calculated using the following formula

$$T_{Dmax} = 2 * \frac{number\ of\ periods\ to\ be\ integrated}{actual\ frequency}$$

If the gate is enabled the input data contains the last valid frequency value. In this state the application cannot request a new range.

The valid frequency range stretches from 0.1 Hz (100_D) up to 10 kHz (100000_D).
To recognize static CL OCK signals, a watchdog timer is implemented. The default value for the timer is 10s. The timer resets on every Power On.
The application is able to change the watchdog time during operation by using the CONTROL byte.
This can be initiated by writing the corresponding value into the output bytes OUTPUT_DATA 1 a nd OUTPUT_DATA 0 be fore setting the T_{VD} REQ bit in the CONTROL byte.
The success of the parameter transfer is acknowledg ed by the module via the T_{VD} ACK bit in the STATUS information.

Attention:

The range of the watchdog timer stretches from 0 to 16383ms ($0x\ 0000_H$ to $0x3FFF_H$) in steps of 1ms per digit.
Values which raise the permitted range of the watchdog timer are masked with 0x3FFF.
If the maximum possible frequency of the different ranges is raised (see the table with maximum frequency ratings), the module will return the non valid data $0xFFFFFFFF_H$.

Organization of the in- and output data for Interbus

Output value of the control unit:

Byte	Identification	
D15-D0	Control Byte	Output Byte 1
D31-D16	Output Byte 0	Output Byte 3
D47-D32	Output Byte 2	

Input value of the control unit:

Byte	Identification	
D15-D0	Status Byte	Input Byte 1
D31-D16	Input Byte 0	Input Byte 3
D2D47-D32	Input Byte 2	

The input-bytes 0 to 3 form the 32 bit counter-output. In the output-bytes 0 to 3 the initial value of the counter can be set.

WAGO➡I/O➡SYSTEM

Digital Outputs (Standard)
PN 750-501...504, 516, 519
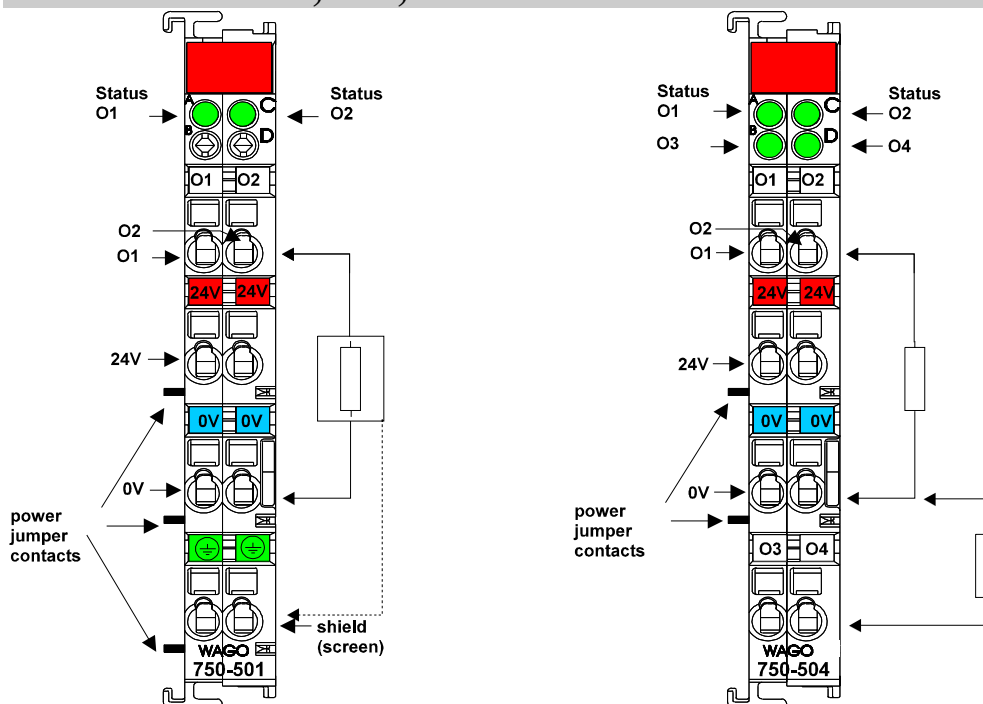
Technical description:

The power supply is provided by a series-connected supply module for the respective operating voltage. Power connections are made automatically from module to module via the internal P.J.C.s when snapped onto the DIN rail.

Attention:

The lowest power jumper contact is not carried out for some modules (e.g. 4-channel)! A module which needs all contacts (e.g. 2 channel digital) may not be connected to the right hand side of modules which do not have 3 power jumper contacts (e.g. 4 channel modules).

For the digital outputs (without diagnostic) four-conductor devices (V+; 0 V; signal; ground) are standard. In case of 12 mm wide 4-channel digital output modules it is not possible to use 4-conductor devices. 4 signal outputs, 2xV+ and 2x0V are provided. All digital outputs are short-circuit protected.

In case of overloads a supply module with fuse (750-601) must be connected on the line side to protect the output modules.

The module 750-516 is low-side switching. The indicated output values have been determined for 100% duty cycle. However, in case of the 2 A versions it is possible to operate single channels at higher load currents, however always verify that the total current does not exceed 3.5 A per module. Example: 2x2A (standard); 1x3.0A; 1x0.5A (total current: 3.5 A) The standard numerical assignment for bus operations is from left to right, starting with the LSB. The positions of the different I/O modules in the configured node/station are selectable by the user. A block type configuration is not necessary.The Output module can be connected to all buscouplers of the WAGO➡I/O➡SYSTEM.

WAGO➡I/O➡SYSTEM

Technical Data:

Item Number 750-	501	502
Number of outputs	2	
Kind of load	resistive, inductive, lamps	
Nominal voltage	24V DC (-15% / +20%)	
Output current (DC)	0,5 A	2 A
Current consumption (internal)	7 mA	
Isolation	500 V system / power supply	
Internal bit width	2	
Configuration	without address or configuration adjustment	
Operating temperature	0°C....+55°C	
Wire connection	CAGE CLAMP; 0,08 to 2,5mm^2	
Dimensions (mm)WxHxL	12 x 64* x 100 (*from upper edge of the carrier rail)	

Item Number 750-	504	516*)
Number of outputs	4	
Kind of load	resistive, inductive, lamps	
Nominal voltage	24V DC (-15% / +20%)	
Output current (DC)	0,5 A	
Current consumption (internal)	15 mA	
Isolation	500 V system / power supply	
Internal bit width	4	
Configuration	without address or configuration adjustment	
Operating temperature	0°C....+55°C	
Wire connection	CAGE CLAMP; 0,08 to 2,5mm^2	
Dimensions (mm)WxHxL	12 x 64* x 100 (*from upper edge of the carrier rail)	

*) low-side switching

Item Number 750-	519
Number of outputs	4
Kind of load	resistive, inductive, lamps
Nominal voltage	5 V DC
Output current (DC)	20 mA
Current consumption (internal)	16 mA
Isolation	500 V system / power supply
Internal bit width	4
Configuration	without address or configuration adjustment
Operating temperature	0°C....+55°C
Wire connection	CAGE CLAMP; 0,08 to 2,5mm^2
Dimensions (mm)WxHxL	12 x 64* x 100 (*from upper edge of the carrier rail)

Digital Outputs (Standard with diagnostics)
PN 750-506
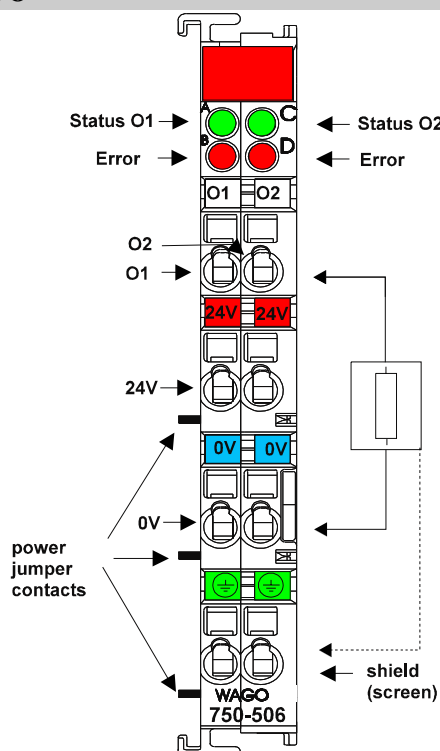
Technical description:

The power supply is provided by a series-connected supply module for the respective operating voltage. Power connections are made automatically from module to module via the internal P.J.C.s when snapped onto the DIN rail.

Attention:

The lowest power jumper contact is not carried out for some modules (e.g. 4-channel)! A module which needs all contacts (e.g. 2 channel digital) may not be connected to the right hand side of modules which do not have 3 power jumper contacts (e.g. 4 channel modules).

Using the digital outputs with diagnostic bit outputs (750-506) allows verification of the I/O channel by the connected bus. Example: a short-circuit at the output or an open circuit will set the appropriate error bit true indicating I/O failure. In this configuration the function module includes 2 digital outputs and 2 separate digital inputs. For the digital outputs with diagnostic four-conductor devices (V+; 0V; signal; ground) are standard. All digital outputs are short-circuit protected.

In case of overloads a supply module with fuse (750-601) must be connected on the line side to protect the output modules.

The standard numerical assignment for bus operations is from left to right, starting with the LSB. The positions of the different I/O modules in the configured node/station are selectable by the user. A block type configuration is not necessary. When using I/O modules with diagnostics, the existing inputs must be considered accordingly in the configuration of the Node/station. The Output module can be connected to all buscouplers of the WAGO➡I/O➡SYSTEM.

WAGO➡I/O➡SYSTEM

Technical Data:

| Item Number 750-	506
Number of outputs	2
Current consumption (internal)	15 mA
Nominal voltage	24V DC (-15%/+20%)
Kind of load	resistive, inductive, lamps
Output current (DC)	0.5 A
Diagnostics	open circuit, overload
Current consumption (internal)	15 mA typ. + load
Isolation	500 V system / power supply
Internal bit width	4 in, 4 out
Configuration	without address or configuration adjustment
Operating temperature	0°C....+55°C
Wire connection	CAGE CLAMP; 0.08 to 2.5mm^2
Dimensions (mm)WxHxL	12 x 64* x 100 (*from upper edge of carrier rail)

The output bits control the state of the outputs.

	Bit 3	Bit 2	Bit 1	Bit 0
function	no function	no function	controls O2	controls O1

The input bits show the state of the outputs.

	Bit 3	Bit 2	Bit 1	Bit 0
function	diagnostics O2	diagnostics O2	diagnostics O1	diagnostics O1
output follows output bit	0	0	0	0
no load is connected	0	1	0	1
short circuit	1	0	1	0
power supply too low*	1	1	1	1

*The diagnostic bits refer to a hysteresis: If the voltage of the field side is higher than 11V in the falling circle, they are switched on. If the voltage is lower than 15,5 V in the growing circle, they are switched off.

WAGO▸I/O▸SYSTEM

Digital Outputs (Solid State Relay)
PN 750-509

Status O1

Status O2

O1 O2

O2
O1

L L

230V

N N

N

power jumper contacts

shield (screen)

WAGO
750-509
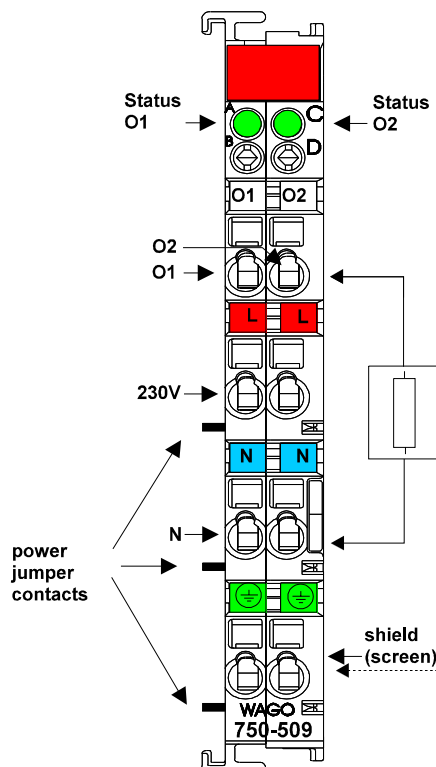
Technical Description

The power supply for the solid state relay module is connected by a series-connected supply module for the respective operating voltage of 230 V. Power connections are made automatically from module to module via the internal P.J.C.s when snapped onto the DIN rail.

Attention:

The lowest power jumper contact is not carried out for some modules (e.g. 4-channel)! A module which needs all contacts (e.g. 2 channel digital) may not be connected to the right hand side of modules which do not have 3 power jumper contacts (e.g. 4 channel modules).

The power supply of the control side is not made via the power jumper contacts but directly from the electronics. The respective output contacts of the switching element are therefore always positioned at the field side. One termination point of these contacts must be directly connected to the power supply. For the digital outputs four-conductor devices (V+; 0V; signal; ground) are standard. All digital outputs are short-circuit protected. **In case of overloads a supply module with fuse (750-609) must be connected on the line side to protect the output modules.**

The standard numerical assignment for Bus operation is from left to right, starting with the LSB. The positions of the different inputs in the configured station are via the user's choice. A block type assembly is not necessary. The Output module can be connected to all buscouplers of the WAGO➠I/O➠SYSTEM.

WAGO➠I/O➠SYSTEM

Technical Data:

Item Number 750-	509
Number of outputs	2
Current consumption (internal)	10 mA
Switching voltage	0 V...230 V AC/DC
Switched current	300 mA AC max.
Speed of operation	1.65 ms typ., 5 ms max.
Volume resistance	2.1 Ω typ., 3.2 Ω max.
Impulse current	0.5 A (20 s), 1.5 A (0.1 s)
Overvoltage protection	>+/- 380 V (suppressor diode)
Isolation	1.5 kV system / power supply
Internal bit width	2
Configuration	without address or configuration adjustment
Operating temperature	0°C....+55°C
Wire connection	CAGE CLAMP; 0.08 to 2.5mm^2
Dimensions (mm)WxHxL	12 x 64* x 100 (*from upper edge of the carrier rail)

Pulsewidth Module
PN 750-511
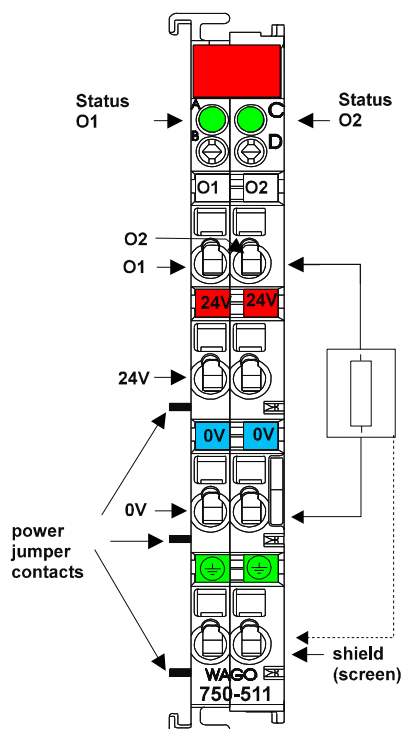
Technical Description:

This description is for hard and software version X X X   X 2 B 0 2- - - - . The part number is displayed on the right side of the module.

The initial pre-programmed base frequency is for 250 Hz. The resolution is 10 Bits and the pulsewidth is modulated.

Attention:

The lowest power jumper contact is not carried out for some modules (e.g. 4-channel)! A module which needs all contacts (e.g. 2 channel digital) may not be connected to the right hand side of modules which do not have 3 power jumper contacts (e.g. 4 channel modules).

The following description is preliminary and is applicable to the factory configuration.

The pulsewidth output module 750-511 produces a binary modulated sig nal of 24 V. The connection of the consuming device should be made via the „O" and 0 V (common) contacts of the module. The distribution of the 24 V DC is made via the power jumper contacts. If galvanic isolation is desired, a new power feed via a 750-602 is required.

The PWM module can be connected to all buscouplers of the W AGO➠I/O➠SYSTEM (except for the economy type).

Technical Data:

Part Number 750-	511
Number of outputs	2
Current consumption (internal)	70 mA typical (internal)
Nominal voltage	24V DC (-15% +20%)
Load type	ohmic, inductive
Output current	0.1 A, short circuit protected
Pulse frequency	1 Hz...20kHz
Duty cycle	0%...100% (T_{on} > 750 ns, T_{off} > 500 ns)
Resolution	10 Bit max.
Isolation	500 V system/power Supply
Configuration	none, optional with software parameter
Current Consumption (field side)	15 mA typ.
Internal bit width per channel	16 Bit Data + 8 Bit Control/Status
Operating temperature	0°C....+55°C
Wire connections	CAGE CLAMP; 0.08 to 2.5mm^2
Dimension (mm)BxHxT	12 x 64* x 100 (*from upper edge of the carrier rail)
Preset Frequency	250 Hz Switching Frequency

WAGO I/O SYSTEM

Formation of on/off times

The programming of the on/off times occur with the resolution of 10 bits. The five LSB of the 16 bit value can be zeros or one. The MSB will hold the sign and is preset to the null state.

Duty Cycle %	Increments	Binary Value	Hex.	Dec.
100	1023	0111 1111 1111 1111	7F FF	32767
100	1023	0111 1111 1111 0000	7F E0	32752
50	511	0011 1111 1111 1111	3F FF	16383
25	255	0001 1111 1111 1111	1F FF	8191
12.5	127	0000 0001 0000 0000	01 00	256
0.1955	2	0000 0000 0100 0000	00 40	16
0.0977	1	0000 0000 0010 0000	00 20	32
0	0	0000 0000 0001 1111	00 1F	31
0	0	0000 0000 0000 0000	0	0

Table 1: Value Formation
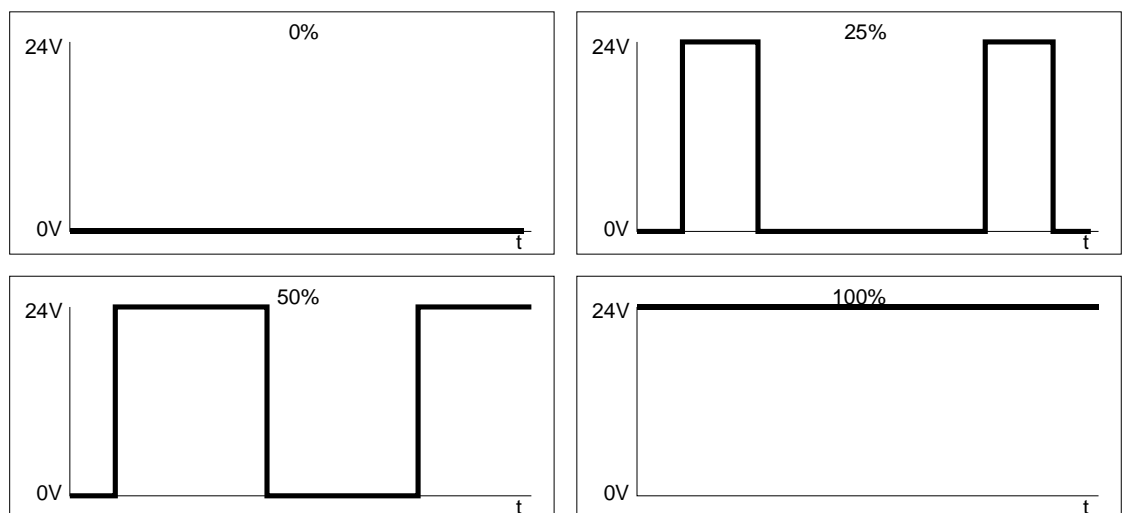
Ill. 1: On/Off time relationships for Table 1.

Process Image Formation for Interbus

The process image of the 750-511 appears with 6 bytes of input and 6 bytes of output data. The byte allocation for the preset duty cycle has the following modes of formation:
Output values:

	Function
D0	Control Byte
D1	Output Byte 1
D2	Output Byte 0
D3	reserved
D4	Output Byte 3
D5	Output Byte 2

Input values:

	Function
D0	Status Byte
D1	Input Byte 1
D2	Input Byte 0
D3	reserved
D4	Input Byte 3
D5	Input Byte 2

Out(In)put byte 0   Low Byte
Out(In)put byte 1   High Byte

WAGO I/O SYSTEM

Digital Outputs (Relay)
PN 750-512...514, 517

Status Relay 1 → A B / C D ← Status Relay 2

13 | 14
O2
O1
+ | +
250V
power jumper contacts
N
WAGO 750-512

Status Relay 1 → A B / C D ← Status Relay 2
13 | 23
14 | 24
power jumper contact
WAGO 750-513

Status Relay 1 → A B / C D ← Status Relay 2
14 | 24
11 | 21
12 | 22
power jumper contact
WAGO 750-514
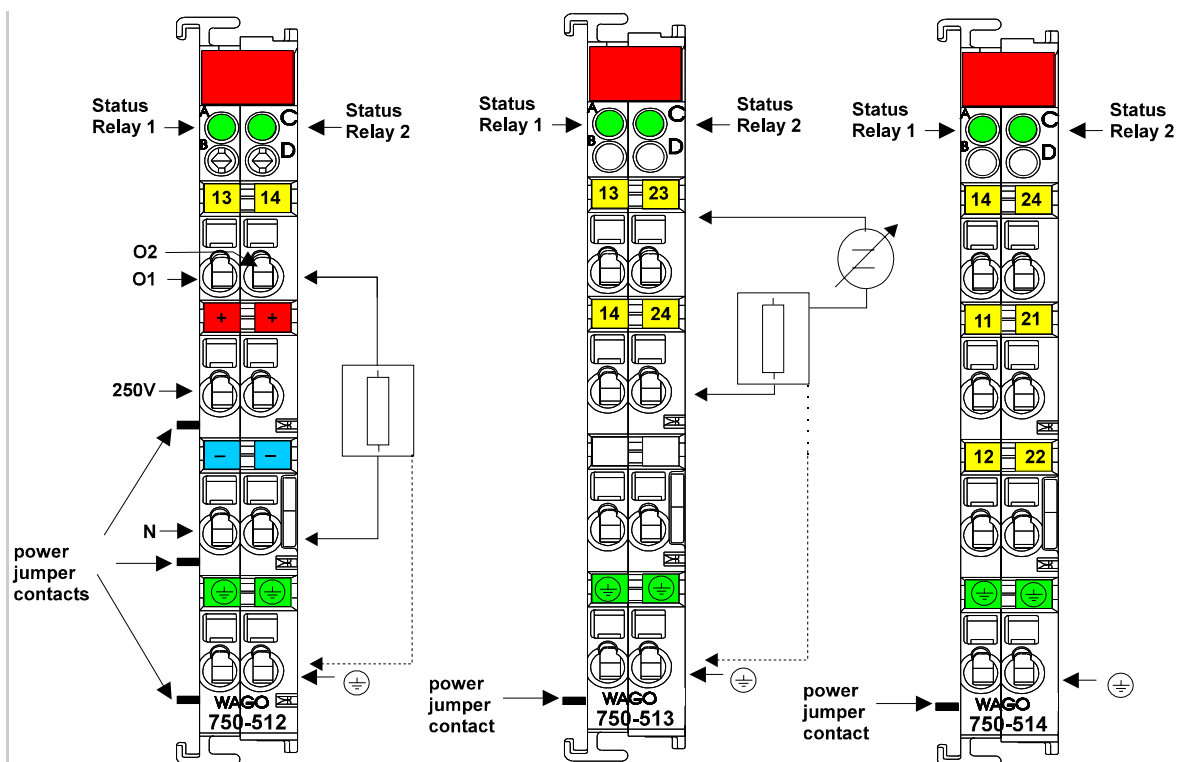
Technical description:

The power supply for the relay coils is not made via the power jumper contacts but directly from the electronics. The respective output contacts of the switching element are therefore always positioned at the field side.

Attention:

The lowest power jumper contact is not carried out for some modules (e.g. 4-channel)! A module which needs all contacts (e.g. 2 channel digital) may not be connected to the right hand side of modules which do not have 3 power jumper contacts (e.g. 4 channel modules).

Version 1: non-floating (750-512)

The power supply is made via a series-connected supply terminal block for the respective operating voltage. Power connections are made automatically from module to module when snapped onto the DIN rail. One termination point of these contacts must be directly connected to the power supply.

Version 2: isolated outputs (750-513, 750-514)

These I/O modules are not provided with integrated power jumper contacts. Care should be taken to supply each isolated module with separate power supply connections.

The standard numerical assignment for Bus operation is from left to right, starting with the LSB. The positions of the different inputs in the configured station are via the user's choice. A block type configuration is not necessary. The output module can be connected to all buscouplers of the WAGO➠I/O➠SYSTEM.

WAGO➠I/O➠SYSTEM

Technical Data:

Item Number 750-	512	513
Type of contact	2 make contacts	
Current consumption (internal)	100 mA max.	
Switching voltage	30 V DC; 250V AC	
Switching power	60 W; 500 VA $\cos \rho_{max}$ =0,4, L/R_{max}=7 ms	
Switching current	2 A AC/ DC	
Isolation	4 kV system/power supply	
Internal bit width	2	
Configuration	without address or configuration adjustment	
Operating temperature	0°C....+55°C	
Wire connection	CAGE CLAMP; 0.08 to 2.5mm^2	
Dimensions (mm)WxHxL	12 x 64* x 100 (*from upper edge of the carrier rail)	

Item Number 750-	514	517[1]
Type of contact	2 changeover	
Current consumption (internal)	70 mA max.	80 mA max.
Switching voltage	30 V DC; 125 V AC	250 V AC
Switching power	30 W; 62.5 VA	1500 VA*
Switching current	0.5 A AC/ 1 A DC	1 A AC
Isolation	1.5 kV system/power supply	4 kV system/ power supply
Internal bit width	2	
Configuration	without address or configuration adjustment	
Operating temperature	0°C....+55°C	
Wire connection	CAGE CLAMP; 0.08 to 2.5mm^2	
Dimensions (mm)WxHxL	12 x 64* x 100 (*from upper edge of the carrier rail)	

*ohmic load
[1] in design

WAGO I/O SYSTEM

Relays in the modules 750-512 and 750-513:

Switching capacity
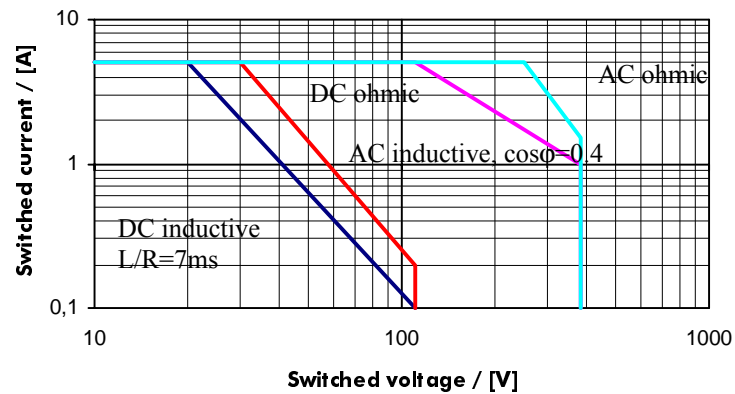
Typical electrical lifetime

30 V DC ohmic
120 V AC ohmic
250 V AC ohmic
30 V DC inductive, L/R = 0.7ms
120 V AC inductive, cosφ=0.4
250 V AC inductive, cosφ=0.4

WAGO ⇒I/O⇒SYSTEM
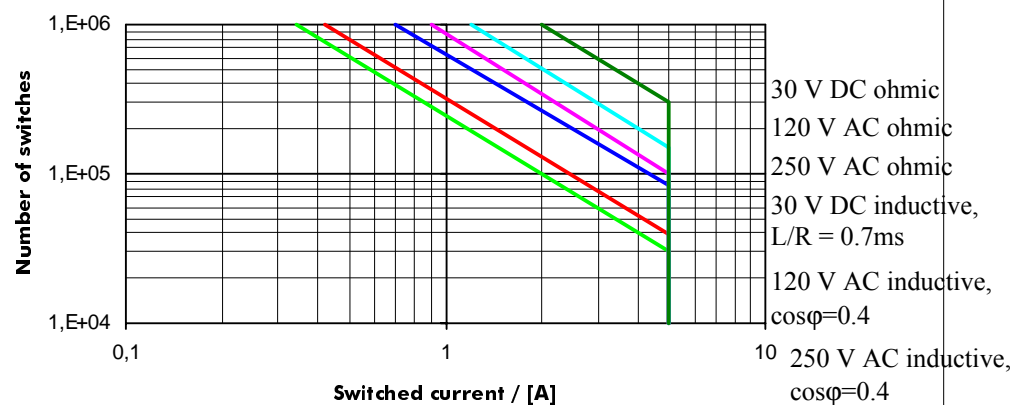
2 Channel Analog Inputs 0-20 mA / 4-20 mA (Differential Inputs) PN 750-452, 454, 750-482, 750-484

Technical Description

This description is only intended for hardware version X X X X 2 A 0 0 - - - -. The serial number can be found on the right side of the module.

The input channels are differential inputs and they have a common ground potential. The inputs are connected to +I and -I. The shield is connected to „S". The connection is made automatically when snapped onto the DIN rail.

These I/O modules are not provided with integrated power jumper contacts. The power supply is made by the data contacts with a DC-DC converter. The modules can work self-supporting.

Attention:
The lowest power jumper contact is not carried out for some modules (e.g. 4-channel)! A module which needs all contacts (e.g. 2 channel digital) may not be connected to the right hand side of modules which do not have 3 power jumper contacts (e.g. 4 channel modules).

The input module can be connected to all buscouplers of the **WAGO➡I/O➡SYSTEM** (except for the economy type).

WAGO➡I/O➡SYSTEM

Technical Data:

Item Number 750-	452	454	482	484
Number of channels	2		2	
Nominal voltage	via system voltage			
Current consumption (internal)	70 mA		70 mA	
Voltage	35 V max.			
Signal current	0-20mA	4-20mA	0-20mA	4-20mA
Resistance	50 Ω typ.			
Resolution	12 Bit			
Isolation	500 V System/Power supply			
Conversion time	2 ms typ.			
Bit width per channel	16 Bit Data, 8 Bit Control/Status			
Operating temperature	0°C....+55°C			
Configuration	none, optional via software parameter			
Wire connection	CAGE CLAMP; 0.08 to 2.5mm^2			
Dimensions (mm)WxHxL	12 x 64* x 100 (*from upper edge of the carrier rail)			

The numerical format

All analog values will be shown in a unit numerical format. The resolution is 12 Bits. The following table will explain the numerical format. (750-452, 454). The 3 least significant Bits are not taken into account.

Input current 0-20 mA	Input current 4-20 mA	Binary Value	Hex.	Dec.
20	20	0111 1111 1111 1000	7F F8	32760
10	12	0100 0000 0000 0000	40 00	16384
5	8	0010 0000 0000 0000	20 00	8192
2.5	6	0001 0000 0000 0000	10 00	4096
0.156	4.125	0000 0001 0000 0000	01 00	256
0.01	4.0078	0000 0000 0001 0000	00 10	16
0.005	4.0039	0000 0000 0000 1000	00 08	8
0	4	0000 0000 0000 0111	00 07	7
0	4	0000 0000 0000 0000	0	0

The numerical format for Siemens

In addition to the full 16 bit indication of the measured value it is possible to use the 'Siemens format'. The measured value is represented by the most significant 12 Bits. The 3 least significant Bits are reserved for diagnostic and status purposes. (750-482, 484)

Input current 4-20 mA	Binary value	X : without meaning F : short circuit or F : open circuit Ü : overflow X F Ü	Hex.	Dec.
> 20	0101 0000 0000 0	0 0 1	50 01	20481
20	0101 0000 0000 0	0 0 0	50 00	20480
16	0100 0000 0000 0	0 0 0	40 00	16384
12	0011 0000 0000 0	0 0 0	30 00	12288
8	0010 0000 0000 0	0 0 0	20 00	8192
4.0078	0001 0000 0000 1	0 0 0	10 08	4104
4	0001 0000 0000 0	0 0 0	10 00	4096
4	0001 0000 0000 0	0 1 1	10 03	4099

WAGO➡I/O➡SYSTEM

Input current 0-20 mA	Binary value	X : without meaning F : short circuit open circuit Ü : overflow X F Ü	Hex.	Dec.
> 20	0100 0000 0000 0	0 0 1	40 01	16385
20	0100 0000 0000 0	0 0 0	40 00	16384
10	0010 0000 0000 0	0 0 0	20 00	8192
5	0001 0000 0000 0	0 0 0	10 00	4096
2.5	0000 1000 0000 0	0 0 0	08 00	2048
1.25	0000 0100 0000 0	0 0 0	04 00	1024
0.625	0000 0010 0000 0	0 0 0	02 00	512
0.0976	0000 0000 0000 1	0 0 0	00 08	8
0	0000 0000 0000 0	0 0 0	00 00	0

If you have questions about the formatting of this data, please contact WAGO for I/O System technical support.

2 Channel Analog Inputs +/- 10 V (Differential Inputs) PN 750-456, 750-456/000-001

Technical Description

This description is only intended for hardware version X X X X 2 A 0 0 - - - -. The serial number can be found on the right side of the module.

The input channels are differential inputs and they have a common ground potential.

The inputs are connected to +I and -I. The shield is connected to „S". The connection is made automatically when snapped onto the DIN rail.

These I/O modules are not provided with integrated power jumper contacts. The power supply is made by the data contacts with a DC-DC converter. The modules can work self-supporting.

Attention:
The lowest power jumper contact is not carried out for some modules (e.g. 4-channel)! A module which needs all contacts (e.g. 2 channel digital) may not be connected to the right hand side of modules which do not have 3 power jumper contacts (e.g. 4 channel modules).

The input module can be connected to all buscouplers of the **WAGO➡I/O➡SYSTEM** (except for the economy type)

Technical Data:

Item Number 750-	456, 456/000-001
Number of channels	2
Nominal voltage	via system voltage (DC DC converter)
Current consumption (internal)	65 mA
Overvoltage protection	35 V max.
Signal voltage	+/- 10 V
Resistance	570 kΩ
Resolution	12 Bit
Isolation	500 V System/Power supply
Conversion time	2 ms typ.
Bit width per channel	16 Bit Data, 8 Bit Control/Status
Operating temperature	0°C....+55°C
Configuration	none, optional via software parameter
Wire connection	CAGE CLAMP; 0.08 to 2.5mm^2
Dimensions (mm)WxHxL	12 x 64* x 100 (*from upper edge of the carrier rail)

Attention:
The value of the input signal should be in a range of 0V to 10V or even no signal.

WAGO→I/O→SYSTEM

The numerical format

All analog values will be shown in a unit numerical format. The resolution is 12 Bits and the 3 LSBs are not taken into account. The following table will explain the numerical format.

Input voltage ±10V	Binary value	Hex.	Dec.	Status
> 10 V	0111 1111 1111 1111	7F FF	32767	42
10	0111 1111 1111 XXXX	7F FX	32760	0
5	0100 0000 0000 XXXX	40 0X	16384	0
2,5	0010 0000 0000 XXXX	20 0X	8192	0
1,25	0001 0000 0000 XXXX	10 0X	4096	0
0,0781	0000 0001 0000 XXXX	01 0X	256	0
0,0049	0000 0000 0001 XXXX	00 1X	16	0
0	0000 0000 0000 XXXX	00 0X	0	0
-2,5	1110 0000 0000 XXXX	E0 0X	57344	0
-5	1100 0000 0000 XXXX	C0 0X	49152	0
-7,5	1010 0000 0000 XXXX	A0 0X	40960	0
-10	1000 0000 0000 XXXX	80 0X	32768	0
< -10 V	1000 0000 0000 0000	80 00	32768	41

WAGO→I/O→SYSTEM

The numerical format for Siemens

In addition to the full 16 bit indication of the measured value it is possible to use the Siemens format. The measured value is represented by the most significant 12 Bits. The 3 least significant bits are reserved for diagnostic and status purposes. (750-456/000-001).

Input voltage ±10V	Binary value	X : without meaning F : short circuit or F : open circuit Ü : overflow X F Ü	Hex.	Dec.
>10	0111 1111 1111 1	0 0 1	7F F9	32761
10	0111 1111 1111 1	0 0 0	7F F8	32760
5	0110 0000 0000 0	0 0 0	60 00	24576
2,5	0101 0000 0000 0	0 0 0	50 00	20480
1,25	0100 1000 0000 0	0 0 0	48 00	18432
0,0049	0100 0000 0000 1	0 0 0	40 08	16392
0	0100 0000 0000 0	0 0 0	40 00	16384
-2,5	0011 0000 0000 1	0 0 0	30 08	12296
-5	0010 0000 0000 0	0 0 0	20 00	8192
-7,5	0001 0000 0000 0	0 0 0	10 00	4096
-10	0000 0000 0000 1	0 0 0	00 00	8
<-10	0000 0000 0000 0	0 0 1	00 01	1

If you hve questions about the formatting of this data, please contact WAGO for the I/O System technical support.

Input for PT 100
PN 750-461, 750-461/000-002, 750-461/000-003, 750-481
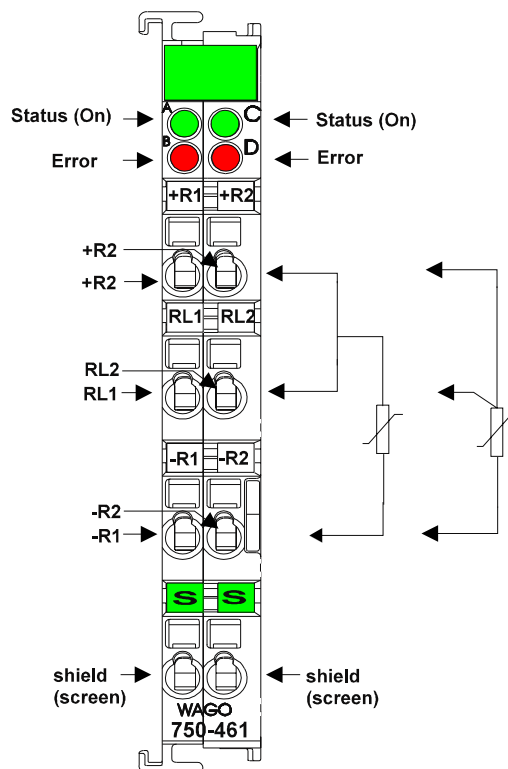
Technical description:

This description is only intended for hardware version X X X X 3 A 0 2 - - - -. The serial number can be found on the right side of the module.

The described configuration is PT 100. The following description is preliminary and is applicable only to the factory configuration.

The inputs are connected to +I and -I. The shield is connected to „S". The connection is made automatically when snapped onto the DIN rail.

Attention:
The lowest power jumper contact is not carried out for some modules (e.g. 4-channel)! A module which needs all contacts (e.g. 2 channel digital) may not be connected to the right hand side of modules which do not have 3 power jumper contacts (e.g. 4 channel modules).

These I/O modules are not provided with integrated power jumper contacts. The power supply is made by the data contacts with a DC-DC converter. The modules can work self-supporting.
The PT100 module can be connected to all buscouplers of the
WAGO➡I/O➡SYSTEM (except for the economy type)

WAGO➡I/O➡SYSTEM

Technical Data:

Item Number 750-	461, 481, 461/000-002, 461/000-003
Number of inputs	2
Input current (internal)	65 mA
Voltage supply	via system voltage
Sensor types	PT100, PT 200, PT 500, PT1000, Ni100, Ni120, Ni1000
Wire connection	2-conductor, 3-conductor (presetting)
Temperature range	PT: -200°C..+850°C Ni:-60°C...250°C
Resolution	0.1°C over the whole area
Isolation DC/DC	400V system / power supply
Measuring current	0.5mA type
Bit width per channel	16 bits: data; 8 bits: control/status
Configuration	none, optional via software parameter
Operating temperature	0°C....+55°C
Wire connection	CAGE CLAMP; 0.08 to 2.5mm^2
Dimensions (mm)WxHxL	12 x 64* x 100 (*from upper edge of the carrier rail)
Presetting	3-conductor PT100

The function module 750-461 allows the direct connection of PT- or Ni-resistance sensors. The module is suitable for 2- or 3-wire RTDs. Connection is made according to the above wiring diagram.

Linearization is accomplished over the entire measurement range by a microprocessor. The temperature ranges of the above listed RTD types is available to the user. The temperature ranges of the sensors are represented with a resolution of 1 bit per 0.1° C in one word (16 bits). Resulting from this, 0°C corresponds to the hexadecimal value 0000 and 100°C is 03E8 (dez.1000). Temperatures below 0° are represented in two's complement with a leading '1'.

The function module works in the defined temperature range for the PT100 sensors of -200°C to +850°C. The voltage resolution is represented with 16 bits. An A/D converter and processor converts the voltage value to a numerical value proportional to the temperature of the selected resistance temperature sensor.

A short circuit or an interruption of the RTD wire is transmitted to the bus module and indicated by the red error LED. The green LED identifies that the module is communicating properly with the connected Buscoupler.

The numerical format

All temperature values will be shown in a unit numerical format. If the mode 'DEFAULT' is selected each bit corresponds to 0.1°C. The possible numerical range refers to the standardized temperature range of the used sensors. The following table will explain the numerical format on a preset PT100. In the third column the numerical format for PT1000 (750-461/000-003) is explained.

Temperature °C	Voltage (Ohm)	Voltage (Ohm)	Binary Value	Hex.	Dec.
	>400				
850	390.481	1384,998	0010 0001 0011 0100	2134	8500
100	138.506	1099,299	0000 0011 1110 1000	03E8	1000
25.5	109.929	1000,391	0000 0000 1111 1111	00FF	255
0.1	100.039	1000	0000 0000 0000 0001	0001	1
0	100	999,619	0000 0000 0000 0000	0000	0
-0.1	99.970	901,929	1111 1111 1111 1111	FFFF	-1
-25.5	90.389	184,936	1111 1111 0000 0001	FF01	-255
-200	18.192		1111 1000 0011 0000	F830	-2000
	<18		1000 0000 0000 0000	8000	-32767

Table 1

WAGO➠I/O➠SYSTEM

The numerical format for 750-461/000-002

All temperature values will be shown in a unit numerical format. Each bit corresponds to 0.1°C. The following table will explain the numerical format for 750-461/000-002.

Voltage (Ohm)	Binary value	Hex.	Dez.
10	0000 0000 0110 0100	00 64	100
100	0000 0011 1110 1000	03 E8	1000
200	0000 0111 1101 0000	07 D0	2000
300	0000 1011 1011 1000	0B B8	3000
400	0000 1111 1010 0000	0F A0	4000
500	0001 0011 1000 1000	13 88	5000
1000	0010 0111 0001 0000	27 10	10000
1200	0010 1110 1110 0000	2E E0	12000

WAGO➧I/O➧SYSTEM

The numerical format for Siemens

In addition to the full 16 bit indication of the measured value it is possible to use the 'Siemens format'. The measured value is represented by the most significant 12 Bits. The 4 least significant Bits are reserved for diagnostic and status purposes. (750-481)

Temp. °C	Ohm	Binary value	X : without meaning F : short circuit or F : open circuit Ü : overflow X F Ü	Hex.	Dec.
	>400	1111 1111 1111 1	0 0 1	FF F9	65529
883	400	0111 1111 1111 1	0 0 0	7F F8	32866
560	300	0110 0000 0000 0	0 0 0	60 00	24576
266	200	0100 0000 0000 0	0 0 0	40 00	16384
0	100	0010 0000 0000 0	0 0 0	20 00	8192
-125	50	0001 0000 0000 0	0 0 0	10 00	4096
-185	25	0000 0101 0000 0	0 0 0	500	1280
-200	20	0000 0100 0000 0	0 0 0	400	1024
<-200	0	0000 0000 0000 0	0 0 1	1	1

If you have questions about the formatting of this data, please contact WAGO for I/O System technical support.

ELECTRONIC

Input for Thermocouple Modules
PN 750-462, 750-469, 750-462/000-XXX
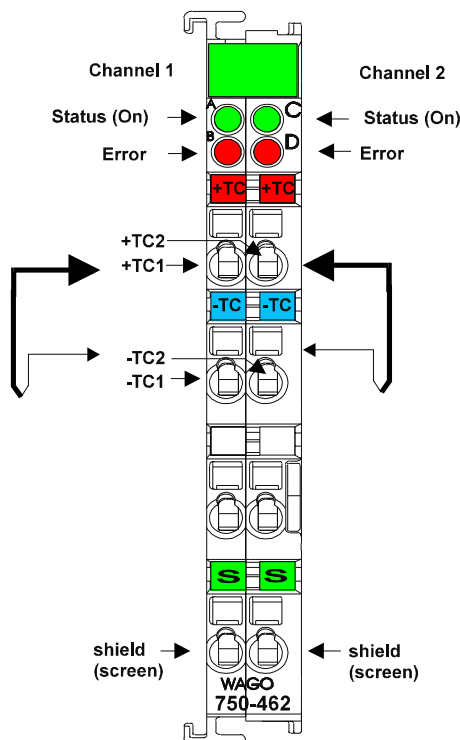
Channel 1   Channel 2

Status (On) → A C ← Status (On)

Error → B D ← Error

+TC +TC

+TC2
+TC1 →

-TC -TC

-TC2
-TC1 →

S S

shield
(screen) →   ← shield
(screen)

WAGO
750-462

Technical description:

This description is only intended for hardware version X X X X 2 A 0 1 - - - -. The serial number can be found on the right side of the module.

The following description is preliminary and is applicable only to the factory configuration.

The shield is connected to „S". The connection is made automatically when snapped onto the DIN rail.

These I/O modules are not provided with integrated power jumper contacts. The power supply is made by the data contacts with a DC-DC converter. The modules can work self-supporting.

Attention:

The lowest power jumper contact is not carried out for some modules (e.g. 4-channel)! A module which needs all contacts (e.g. 2 channel digital) may not be connected to the right hand side of modules which do not have 3 power jumper contacts (e.g. 4 channel modules).

The thermocouple module can be connected to all buscouplers of the
WAGO➡I/O➡SYSTEM (except for the economy type)

WAGO➡I/O➡SYSTEM

Technical Data:

Item Number 750-	462, 469
Number of inputs	2 (differential input, max. +/- 3.5V)
Voltage supply	via system voltage
Sensor types	J, K, B, E, N, R, S, T, U, L, mV Messung
Cold junction compensation	on each module
Measuring accuracy	<25 µV, typ. 15 µV
Resolution	0.1°C per Bit
Isolation DC/DC	500V system / power supply
Input current (internal)	65 mA max.
Bit width per channel	16 Bit: data; 8 Bit: control/status* (detection of broken wire 750-469)
Configuration	none, optional via software parameter
Operating temperature	0°C....+55°C
Connection technique	CAGE CLAMP; 0.08 to 2.5mm^2
Dimensions (mm)WxHxL	12 x 64* x 100 (*from upper edge of the carrier rail)
Presetting	-100°C / +1370°C, Typ K

The function module 750-462 permits the direct connection of thermocouple sensors. The module is suitable for 2 or 3-wire thermocouples. For the 2-wire connection technique, connect the thermocouple wires between TC- and TC+ . For the 3-conductor technique the shield is also connected. The operation of grounded sensors is provided by means of internal electrical isolation.

The function module 750-469 alos detects a broken wire. You can find the PNs for the different sensor types for 750-462 in the following table.

Warning: Both inputs are referenced to a common potential (not isolated)!

The linearization is provided over the complete range by a microprocessor. The temperature ranges of the sensors are represented with a resolution of 1 bit per 0.1°C in one word (16 Bit). Thus, 0°C corresponds to the value 0000, and 25.5°C correspond to the value 0 x 00FF. Temperatures below 0°C are represented in two's complement with a leading '1'.

Within the whole range of all thermocouples, the function module works like a 'µV meter'. The voltage resolution is represented with 16 bits. A processor converts the voltage value into a numerical value proportional to the measured temperature of the selected type of thermocouple.

In order to compensate the offset voltage at the clamping point, a cold junction thermocouple compensation calculation is carried out. The circuit contains a temperature measuring sensor at the 'CAGE CLAMP' connection and considers the temperature offset voltage when calculating the measured value.

Temperature Ranges of the connectable sensors:

L	-25°C....+900°C		
K	-100°C...1370°C (Default)		
J	-100°C...+1200°C	750-462/000-006	750-469/000-006
E	-100°C...1000°C	750-462/000-008	750-469/000-008
T	-100°C...+400°C	750-462/000-002	750-469/000-002
N	-100°C...+1300°C	750-462/000-009	750-469/000-009
U	-25°C...+600°C	750-462/000-011	750-469/000-011
B	600°C...+1800°C	750-462/000-007	750-469/000-007
R	0°C...+1700°C	750-462/000-010	750-469/000-010
S	0°C...+1700°C	750-462/000-001	750-469/000-001
mV-Meter	-120 mV...+120 mV	750-462/000-003	750-469/000-003

Table 1: Temperature ranges of the connectable sensors

Attention: The range of the mV Meter is 0 to 120mV at the moment!

LED functions:

green LED: Function
> ON: Normal
> OFF: Watchdog-Timer Overflow
> If the PLC does not transmit processing data for 100 ms the green LED stops lightning.

red LED: Error
> ON: Over- or underrange or broken wire (bei 750-469)
> OFF: voltage is in the measuring range

WAGO➠I/O➠SYSTEM

The numerical formats

All temperature values are represented in a uniform numerical format. In the default setting (type K) one Bit corresponds to 0.1°C. The output value corresponds to the temperature range of each sensor as defined according to standards. By using a configuration tool, the output formats can be chosen. The linearization can be switched off and the building of the reference temperature can be switched off also. The following table identifies the numerical format on the default range (type K).

Temp. °C	Voltage (uV)	Binary Value	Hex.	Dec.
850	35314	0010 0001 0011 0100	2134	8500
100	4095	0000 0011 1110 1000	03E8	1000
25,5	1021	0000 0000 1111 1111	00FF	255
0,1	4	0000 0000 0000 0001	0001	1
0	0	0000 0000 0000 0000	0000	0
-0,1	-4	1111 1111 1111 1111	FFFF	-1
-25,5	-986	1111 1111 0000 0001	FF01	-255
-100	-3553	1111 1100 0001 1000	FC18	-1000

Table 2: Numerical formats

WAGO➟I/O➟SYSTEM

2 Channel Analog Input 0-20 mA / 4- 20 mA single ended
PN 750-465, 750-466, 750-486, 750-465/000-001

Technical Description

This description is only intended for hardware version X X X X 2 A 0 1 - - - -. The serial number can be found on the right side of the module.

The input channels are single ended and they have a common ground potential.

The inputs are connected to +I. Via 24 V / 0 V a sensor can be provided directly from the module. Power connections are made automatically from module to module when snapped onto the DIN rail.

The shield is connected to „S". The connection is made automatically when snapped onto the DIN rail.

Attention:
The lowest power jumper contact is not carried out for some modules (e.g. 4-channel)! A module which needs all contacts (e.g. 2 channel digital) may not be connected to the right hand side of modules which do not have 3 power jumper contacts (e.g. 4 channel modules).

The input module can be connected to all buscouplers of the **WAGO I/O SYSTEM** (except for the economy type).

WAGO I/O SYSTEM

Technical Data:

Item Number 750-	465 465/000-001	466 486
Number of channels	2	
Nominal voltage	24 V DC (-15% / +20%) via power jumper contacts	
Current consumption (internal)	75 mA typ.	
Overvoltage protection	35 V max.	
Signal current	0-20mA	4-20mA
Resistance	50 Ω typ.	
Resolution	12 Bit	
Isolation	500 V system/power supply	
Conversion time	2 ms typ.	
Bit width per channel	16 Bit Data, 8 Bit Control/Status	
Operating temperature	0°C....+55°C	
Configuration	none, optional via software parameter	
Wire connection	CAGE CLAMP; 0.08 to 2.5mm^2	
Dimensions (mm)WxHxL	12 x 64* x 100 (*from upper edge of the carrier rail)	

The numerical format

All analog values will be shown in a unit numerical format. The resolution is 12 Bits. The following table will explain the numerical format. (750-465, 466). The 3 LSBs are not taken into account.

Input current 0-20mA	Input current 4-20mA	Binary value	Hex.	Dec.	Status	LED
>20,5	>20,5	0111 1111 1111 1111	7F FF	32767	42	on
20	20	0111 1111 1111 1111	7F FF	32767	0	off
10	12	0100 0000 0000 0XXX	40 00	16384	0	off
5	8	0010 0000 0000 0XXX	20 00	8192	0	off
2,5	6	0001 0000 0000 0XXX	10 00	4096	0	off
0,156	4,125	0000 0001 0000 0XXX	01 00	256	0	off
0,01	4,0078	0000 0000 0001 0XXX	00 10	16	0	off
0,005	4,0039	0000 0000 0000 1XXX	00 08	8	0	off
0	4	0000 0000 0000 0XXX	00 00	7	0	off
0	3,5 - 4	0000 0000 0000 0000	0	0	0	off
0	0 - 3,5	0000 0000 0000 0000	0	0	41	on (4 -20

The numerical format for Siemens

In addition to the full 16 bit indication of the measured value it is possible to use the 'Siemens format'. The measured value is represented by the most significant 12 Bits. The 3 least significant Bits are reserved for diagnostic and status purposes. (750-465/000-001).

Input current 0-20mA	Binary value	X : without meaning F : short circuit or F : open circuit Ü : overflow X F Ü	Hex.	Dec.	Status	LED
>20,5	0100 0000 0000 0	0 0 1	4001	16385	42	on
20	0100 0000 0000 0	0 0 0	4000	16384	0	off
10	0010 0000 0000 0	0 0 0	2000	8192	0	off
5	0001 0000 0000 0	0 0 0	1000	4096	0	off
2,5	0000 1000 0000 0	0 0 0	0800	2048	0	off
1,25	0000 0100 0000 0	0 0 0	0400	1024	0	off
0,625	0000 0010 0000 0	0 0 0	0200	512	0	off
0,0976	0000 0000 0000 1	0 0 0	0008	8	0	off
0	0000 0000 0000 0	0 0 0	0000	0	0	off

WAGO▪▶I/O▪▶SYSTEM

750-466/000-200 or 750-486:

Input current 4-20mA	Binary value	X : without meaning F : short circuit or F : open circuit Ü : overflow X F Ü	Hex.	Dec.	Status	LED
>20,5	0101 0000 0000 0	0 0 1	40 01	16385	42	on
20	0101 0000 0000 0	0 0 0	50 00	20480	0	off
16	0100 0000 0000 0	0 0 0	40 00	16384	0	off
12	0011 0000 0000 0	0 0 0	30 00	12288	0	off
8	0010 0000 0000 0	0 0 0	20 00	8192	0	off
4,0078	0001 0000 0000 1	0 0 0	1008	4104	0	off
4	0001 0000 0000 0	0 0 0	1000	4096	0	off
<3,5	0001 0000 0000 0	0 1 1	1003	4099	0	on

If you have questions about the formatting of this data, please contact WAGO for I/O System technical support.

2 / 4 Channel Analog Inputs 0-10 V
single ended
PN 750-467, 468, 487, 488
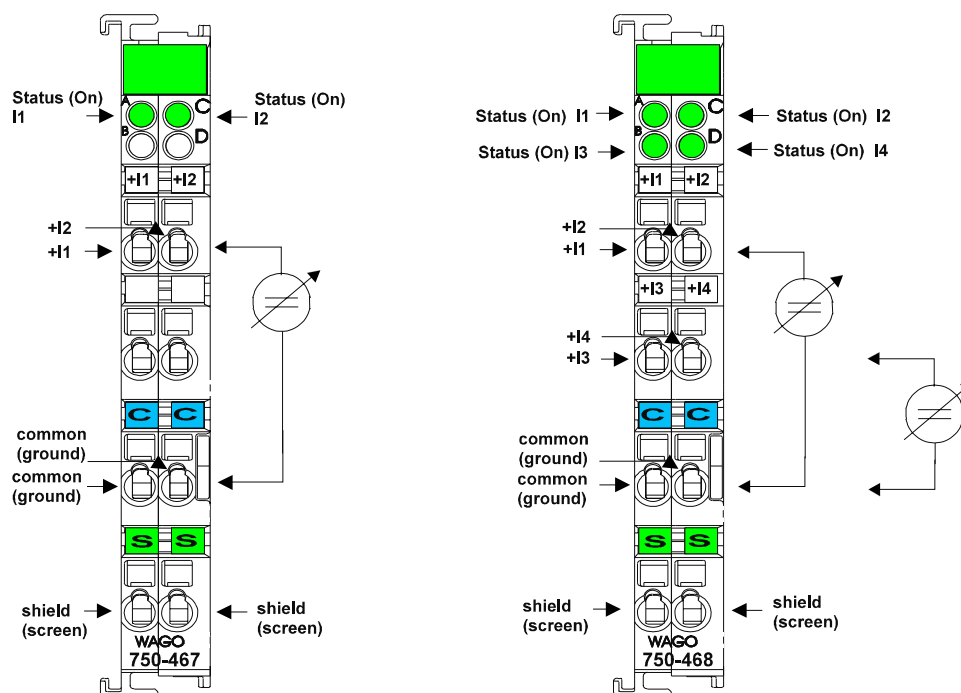
Technical Description

This description is only intended for hardware version X X X X 2 A 0 0 - - - -. The serial number can be found on the right side of the module.

The input channels are single ended and they have a common ground potential.

The inputs are connected to +I and M. The shield is connected to „S". The connection is made automatically when snapped onto the DIN rail.

These I/O modules are not provided with integrated power jumper contacts. The power supply is made by the data contacts with a DC-DC converter. The modules can work self-supporting.

Attention:
The lowest power jumper contact is not carried out for some modules (e.g. 4-channel)! A module which needs all contacts (e.g. 2 channel digital) may not be connected to the right hand side of modules which do not have 3 power jumper contacts (e.g. 4 channel modules).

The input module can be connected to all buscouplers of the **WAGO I/O SYSTEM** (except for the economy type)

Technical Data:

Item Number 750-	467	468	487	488
Number of channels	2	4	2	4
Nominal voltage	via system voltage (DC DC converter)			
Current consumption (internal)	60 mA	60 mA	60 mA	60 mA
Overvoltage protection	35 V max.			
Signal voltage	0-10 V			
Resistance	133 kΩ typ.			
Resolution	12 Bit			
Isolation	500 V system/power supply			
Conversion time	2 ms typ.			
Bit width per channel	16 Bit Data, 8 Bit Control/Status			
Operating temperature	0°C....+55°C			
Configuration	none, optional via software parameter			
Wire connection	CAGE CLAMP; 0.08 to 2.5mm^2			
Dimensions (mm)WxHxL	12 x 64* x 100 (*from upper edge of the carrier rail)			

The numerical format

All analog values will be shown in a unit numerical format. The resolution is 12 Bits. The following table will explain the numerical format. (750-467, 468). The 3 LSBs are not taken into account.

Input voltage 0-10V	Binary value	Hex.	Dec.	Status
> 10	0111 1111 1111 1111	7F FF	32767	42
10	0111 1111 1111 1XXX	7F F8	32760	0
5	0100 0000 0000 0XXX	40 00	16384	0
2,5	0010 0000 0000 0XXX	20 00	8192	0
1,25	0001 0000 0000 0XXX	10 00	4096	0
0,0781	0000 0001 0000 0XXX	01 00	256	0
0,0049	0000 0000 0001 0XXX	00 10	16	0
0,0024	0000 0000 0000 1XXX	00 08	8	0
0	0000 0000 0000 0XXX	00 07	7	0
0	0000 0000 0000 0XXX	0	0	0

WAGO➡I/O➡SYSTEM

The numerical format for Siemens

In addition to the full 16 bit indication of the measured value it is possible to use the 'Siemens format'. The measured value is represented by the most significant 12 Bits. The 3 least significant Bits are reserved for diagnostic and status purposes. (750-487, 488)

Input voltage 0-10V	Binary value	X : without meaning F : short circuit or F : open circuit Ü : overflow X F Ü	Hex.	Dec.	Status
>10	0101 0000 0000 0	0 0 1	50 01	20481	42
10	0101 0000 0000 0	0 0 0	50 00	20480	0
5	0011 0000 0000 0	0 0 0	30 00	12288	0
2,5	0010 0000 0000 0	0 0 0	20 00	8192	0
1,25	0001 1000 0000 0	0 0 0	18 00	6144	0
0,0049	0001 0000 0000 1	0 0 0	10 08	4104	0
0	0001 0000 0000 0	0 0 0	10 00	4096	0

If you have questions about the formatting of this data, please contact WAGO for I/O System technical support.

ELECTRONIC

2 Channel Analog Input 0-20mA / 4-20mA single ended
PN 750-472, 750-472/000-200, 750-474, 750-474/000-200
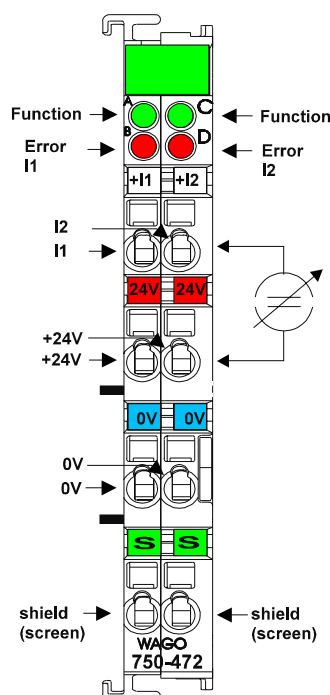
Technical description:

This description is only intended for hardware and software version X X X X 0 2 0 2- - - -. The serial number can be found on the right side of the module.

The input channels are single ended and they have a common ground potential.
The inputs are connected to +I. Via 24 V / 0 V a sensor can be provided directly from the module. Power connections are made automatically from module to module when snapped onto the DIN rail.

The shield is connected to „S". The connection is made automatically when snapped onto the DIN rail.

⚠ **Attention:**
The lowest power jumper contact is not carried out for some modules (e.g. 4-channel)! A module which needs all contacts (e.g. 2-channel digital) may not be connected to the right hand side of modules which do not have 3 power jumper contacts (e.g. 4-channel modules).

The input module can be connected to all buscouplers of the **WAGO➟I/O➟SYSTEM** (except for the economy type).

WAGO➟I/O➟SYSTEM

Technical Data:

Item Number 750-	472 472/000-200	474 474/000-0200
Number of channels	2	
Nominal voltage	24 V DC (-15% / +20%) via power jumper contacts	
Overvoltage protection	24 V max.	
Internal current	75 mA typ.	
Input signal	0-20mA	4-20mA
Input current	< 38 mA at 24 V	
Resistance	50 Ω	
Input voltage	non-linear/overload protection: U=1,2 V DC+160Ω*I_{mess}	
Resolution	internal 16 Bit, 15 Bit via fieldbus	
Input filter	50 Hz	
Noise rejection at sampling frequency	< -100 dB	
Noise rejection below sampling frequency	< -40 dB	
Transition frequency	13 Hz	
Isolation	500 V system/power supply	
Conversion time	80 ms typ.	
Bit width per channel	16Bit: Data; optional 8Bit: Control/Status	
Configuration	none, optional via software parameter	
Operating temperature	0°C....+55°C	
Wire connection	CAGE CLAMP; 0,08 to 2,5mm^2	
Dimensions (mm)WxHxL	12 x 64* x 100 *from upper edge of the carrier rail	

The numerical format

The resolution of 750-472 and 750-474 are 15 Bit.

Input current 0-20mA	Input current 4-20mA	Binary value	Hex.	Dec.	Status	LED
>20,5	>20,5	0111 1111 1111 1111	7F FF	32767	42	on
20	20	0111 1111 1111 1111	7F FF	32767	0	off
10	12	0100 0000 0000 0000	40 00	16384	0	off
5	8	0010 0000 0000 0000	20 00	8192	0	off
2,5	6	0001 0000 0000 0000	10 00	4096	0	off
0,156	4,125	0000 0001 0000 0000	01 00	256	0	off
0,01	4,0078	0000 0000 0001 0000	00 10	16	0	off
0,005	4,0039	0000 0000 0000 1000	00 08	8	0	off
0	4	0000 0000 0000 0000	00 00	7	0	off
0	3,5 - 4	0000 0000 0000 0000	0	0	0	off
0	0 - 3,5	0000 0000 0000 0000	0	0	41	on (4-20

WAGO⇢I/O⇢SYSTEM

The numerical format for Siemens

In addition to the full 16 Bit indication of the measured value it is possible to use the „Siemens format". The measured value is represented by the most significant 12 Bits. The 3 least significant Bits are reserved for diagnostic and status purpose (750-472/000-200, 750-474/000-200). The numerical format for 750-472/000-200 is equivalent to S5 463, 750-474/000-200 equivalent to S5 460/465.

Input current 4-20mA	Binary value	X : without meaning F : short circuit or F: open circuit Ü : overflow X F Ü	Hex.	Dec.	Status	LED
32	0111 1111 1111 1	0 0 1	7F F9	32761	42	on
31,99	0111 1111 1111 0	0 0 0	7F F0	32752	0	off
20,5	0101 0010 0000 0	0 0 1	52 00	20992	0	off
20	0101 0000 0000 0	0 0 0	50 00	20480	0	off
16	0100 0000 0000 0	0 0 0	40 00	16384	0	off
12	0011 0000 0000 0	0 0 0	30 00	12288	0	off
8	0010 0000 0000 0	0 0 0	20 00	8192	0	off
4,0078	0001 0000 0000 1	0 0 0	10 08	4104	0	off
4	0001 0000 0000 0	0 0 0	10 00	4096	0	off
3,5	0000 1110 0000 0	0 1 1	0E 00	3584	0	on
0	0000 0000 0000 0	0 0 0	00 00	0	0	on

Input current 0-20mA	Binary value	X : without meaning F : short circuit or F: open circuit Ü : overflow X F Ü	Hex.	Dec.	Status	LED
30	0110 0000 0000 0	0 0 1	6001	24577	42	on
29,98	0101 1111 1111 1	0 0 0	5F F8	24568	0	on
20,5	0100 0001 1001 1	0 0 0	41 98	16762	0	on
20	0100 0000 0000 0	0 0 0	4000	16384	0	off
10	0010 0000 0000 0	0 0 0	2000	8192	0	off
5	0001 0000 0000 0	0 0 0	1000	4096	0	off
2,5	0000 1000 0000 0	0 0 0	0800	2048	0	off
1,25	0000 0100 0000 0	0 0 0	0400	1024	0	off
0,625	0000 0010 0000 0	0 0 0	0200	512	0	off
0,00976	0000 0000 0000 1	0 0 0	0008	8	0	off
0	0000 0000 0000 0	0 0 0	0000	0	0	off

If you have questions about the formatting of this data, please contact WAGO for I/O System technical support.

ELECTRONIC

2-Channel Analog Input
± 10 V, 16 Bit, single ended   750-476
0 -10 V, 16 Bit, single ended   750-478
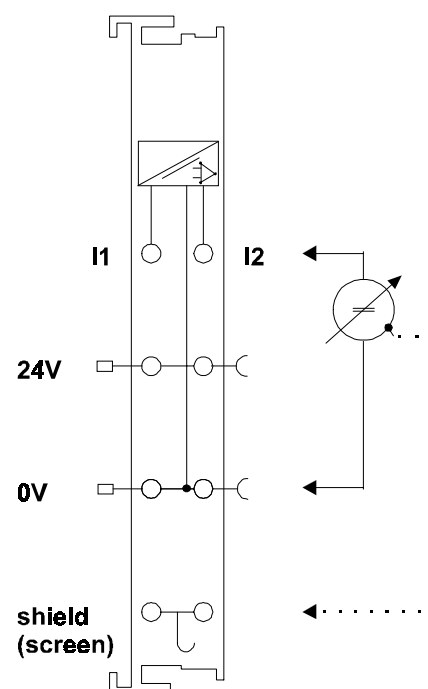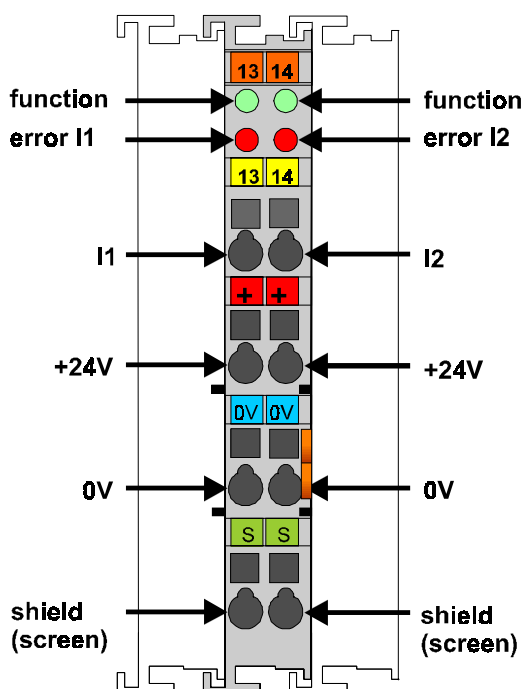
Function clamp and variants

Item-No.	Description	Identification
750-476	2-Channel Analog Input ± 10 V, single ended	2 AI ± 10 V DC 16 Bit s.e.
750-476/000-200	2-Channel Analog Input ± 10 V, single ended with status infomation within the data word	2 AI ± 10 V DC 16 Bit s.e. S5-466

750-478	2-Channel Analog Input 0-10 V, single ended	2 AI 0-10 V DC 16 Bit s.e.
750-478/000-200	2-Channel Analog Input 0-10 V, single ended with status infomation within the data word	2 AI 0-10 V DC 16 Bit s.e. S5-466

Technical description

This description is only intended for hardware and software version
X X X X 0 4 0 1 - - - - .The serial number can be found on the right side of the module.

The input channels are single ended and they have a common ground potential.

The inputs are connected to I and 0V.
The shield is connected to „S". The connection is made automatically when snapped onto the DIN rail.

Attention:
The lowest power jumper contact is not carried out for some modules (e.g. 4-channel)!
A module which needs all contacts (e.g. 2-channel digital) may not be connected to the right hand side of modules which do not have 3 power jumper contacts (e.g. 4-channel modules).

The input module can be connected to all buscouplers of the **WAGO**➟**I/O**➟**SYSTEM** (except for the economy type).

Technical Data

Item Number	750-476 750-476/000-200	750-478 750-478/000-200
Number of channels	2	
Nominal voltage	via system voltage (DC/DC)	
Overvoltage resistance	24 V max.	
Internal current consumption	75 mA typ.	
Input signal	+/- 10 V	0 - 10 V
Input impedance	130 kΩ typ.	
Overvoltage protection	24 V protected against polarity reversal	
Resolution	15 Bit + sign	
Input filter	50 Hz	
Noise rejection at sampling frequency	< -100 dB	
Noise rejection below sampling frequency	< -40 dB	
Transition frequency	13 Hz	
Isolation	500 V system/power supply	
Wandlungszeit	80 ms typ.	
Bitwidth per channel	16Bit: Data; optional 8Bit: control/status	
Configuration	none, optional via software parameter	
Operating temperature	0°C....+55°C	
Wire connection	CAGE CLAMP; 0,08 bis 2,5mm^2	
Dimensions (mm)WxHxL	12 x 64* x 100 * from upper edge of the carrier rail	

WAGO➡I/O➡SYSTEM

The numerical format

All analog values will be shown in a unit numerical format. The resolution for 750-476 and 750-478 is 15 Bit plus sign.

750-476, -478

| Input voltage | | Value | | | Status | LED |
0-10V	±10V	Binary	Hex.	Dec.	(hex)	error I (1,2)
>11	>11	0111 1111 1111 1111	0x7FFF	32767	0x42	on
>10,5	>10,5	0111 1111 1111 1111	0x7FFF	32767	0x42	off
10	10	0111 1111 1111 1111	0x7FFF	32767	0x00	off
5	5	0100 0000 0000 0000	0x4000	16384	0x00	off
2,5	2,5	0010 0000 0000 0000	0x2000	8192	0x00	off
1,25	1,25	0001 0000 0000 0000	0x1000	4096	0x00	off
0,0781	0,0781	0000 0001 0000 0000	0x0100	256	0x00	off
0,049	0,049	0000 0000 0001 0000	0x0010	16	0x00	off
0,0003	0,0003	0000 0000 0000 0001	0x0001	1	0x00	off
0	0	0000 0000 0000 0000	0x0000	0	0x00	off
<-0,5		0000 0000 0000 0000	0x0000	0	0x41	off
<-1		0000 0000 0000 0000	0x0000	0	0x41	on
	-5	1100 0000 0000 0000	0xC000	49152	0x00	off
	-10	1000 0000 0000 0000	0x8000	32768	0x00	off
	<-10,5	1000 0000 0000 0000	0x8000	32768	0x41	off
	<-11	1000 0000 0000 0000	0x8000	32768	0x41	on

Numerical format with status information

For fieldbus master, which evaluates status information in the data word, e.g. from Siemens, a variant of the function clamp is available.
The format containes the status in Bit B0 .. B2.
The digitalized measuring value is placed at the position Bit B3 .. B15. The numerical format is equivalent to S5 466.

750-476/000-200

Input voltage ±10 V	Value Binary	X E O[*]	Hex.	Dec.	Status	LED error I (1,2)
> 11	0011 1111 1111 1	0 0 1	0x3FF9	16377	0x42	on
> 10,5	0011 1111 1111 1	0 0 1	0x3FF9	16377	0x42	off
10	0011 1111 1111 1	0 0 0	0x3FF8	16376	0x00	off
5	0010 0000 0000 0	0 0 0	0x2000	8192	0x00	off
2,5	0001 0000 0000 0	0 0 0	0x1000	4096	0x00	off
1,25	0000 1000 0000 0	0 0 0	0x0800	2048	0x00	off
0,0781	0000 0000 1000 0	0 0 0	0x0080	128	0x00	off
0,0049	0000 0000 0000 1	0 0 0	0x0008	8	0x00	off
0	0000 0000 0000 0	0 0 0	0x0000	0	0x00	off
-5	1110 0000 0000 0	0 0 0	0xE000	57344	0x00	off
-10	1100 0000 0000 0	0 0 0	0xC000	49152	0x00	off
< -10,5	1100 0000 0000 0	0 0 1	0xC001	49153	0x41	off
< -11	1100 0000 0000 0	0 0 1	0xC001	49153	0x41	on

[*] X : without meaning, E : short circuit or open circuit, O : overflow

750-478/000-200

Input voltage 0-10 V	Value Binary	X E O[*]	Hex.	Dec.	Status	LED error I (1,2)
> 11	0111 1111 1111 1	0 0 1	0x7FF9	32761	0x42	on
> 10,5	0111 1111 1111 1	0 0 1	0x7FF9	32761	0x42	off
10	0111 1111 1111 1	0 0 0	0x7FF8	32760	0x00	off
5	0100 0000 0000 0	0 0 0	0x4000	16384	0x00	off
2,5	0010 0000 0000 0	0 0 0	0x2000	8192	0x00	off
1,25	0001 0000 0000 0	0 0 0	0x1000	4096	0x00	off
0,0781	0000 0001 0000 0	0 0 0	0x0100	256	0x00	off
0,049	0000 0000 0001 0	0 0 0	0x0010	16	0x00	off
0,024	0000 0000 0000 1	0 0 0	0x0008	8	0x00	off
0	0000 0000 0000 0	0 0 0	0x0000	0	0x00	off
< -0,5	0000 0000 0000 0	0 0 1	0x0001	1	0x41	off
< -1	0000 0000 0000 0	0 0 1	0x0001	1	0x41	on

[*] X : without meaning, E : short circuit or open circuit, O : overflow

WAGO⇒I/O⇒SYSTEM

Status byte

Structure of the status byte:

bit	7	6	5	4	3	2	1	0
meaning	0	ERROR	res.	res.	res.	res.	Overrange	Underrange

- ERROR   error at the input channel.
- Overrange   exceed the allowable measuring range.
- Underrange   fall below the allowable measuring range.

2 Channel Analog Outputs 0-10 V
PN 750-550, 750-580
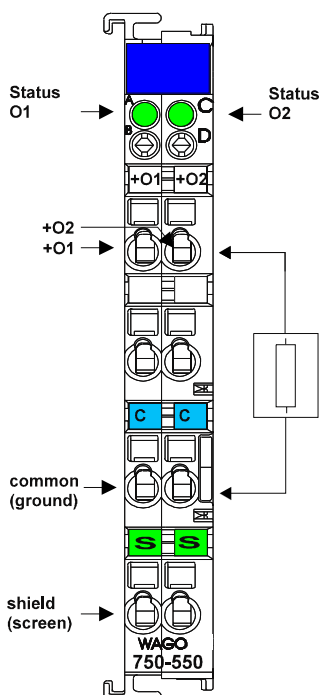
Status O1 → A / B

Status O2 ← C / D

+O1 | +O2

+O2 / +O1 →

common (ground) →

C | C

shield (screen) →

S | S

WAGO
750-550

Technical Description

This description is only intended for hardware version X X X X 2 A 0 1 - - - -. The serial number can be found on the right side of the module.

The output signal of 750-550/551 is a 0-10 V signal. Sensors may be connected to „O" and to the common ground.

The shield is connected to „S". The connection is made automatically when snapped onto the DIN rail.

These I/O modules are not provided with integrated power jumper contacts. The power supply is made by the data contacts with a DC-DC converter. The modules can work self-supporting.

⚠️ **Attention:**
The lowest power jumper contact is not carried out for some modules (e.g. 4-channel)! A module which needs all contacts (e.g. 2 channel digital) may not be connected to the right hand side of modules which do not have 3 power jumper contacts (e.g. 4 channel modules).

The output module can be connected to all buscouplers of the
WAGO➡I/O➡SYSTEM (except for the economy type).

WAGO➡I/O➡SYSTEM

Technical Data:

Item Number 750-	550, 580
Number of channels	2
Nominal voltage	via system voltage (DC DC converter)
Current consumption (internal)	65 mA
Voltage supply	via system voltage (DC-DC)
Signal voltage	0-10 V
Resistance	> 5 kΩ
Resolution	12 Bit
Isolation	500 V system/power supply
Bit width per channel	16 Bit Data, 8 Bit Control/Status
Operating temperature	0°C....+55°C
Configuration	none, optional via software parameter
Wire connection	CAGE CLAMP; 0.08 to 2.5mm^2
Dimensions (mm)WxHxL	12 x 64* x 100 (*from upper edge of the carrier rail)

The numerical format

All analog values will be shown in a unit numerical format. The resolution is 12 Bits. The 3 LSBs are not taken into account. The following table will explain the numerical format. (750-550).

Output voltage 0-10 V	Binary Value	Hex.	Dec.
10	0111 1111 1111 1111	7F F8	32767
5	0100 0000 0000 0000	40 00	16384
2.5	0010 0000 0000 0000	20 00	8192
1.25	0001 0000 0000 0000	10 00	4096
0.0781	0000 0001 0000 0000	01 00	256
0.0049	0000 0000 0001 0000	00 10	16
0.0024	0000 0000 0000 1000	00 08	8
0	0000 0000 0000 0111	00 07	7
0	0000 0000 0000 0000	0	0

WAGO➠I/O➠SYSTEM
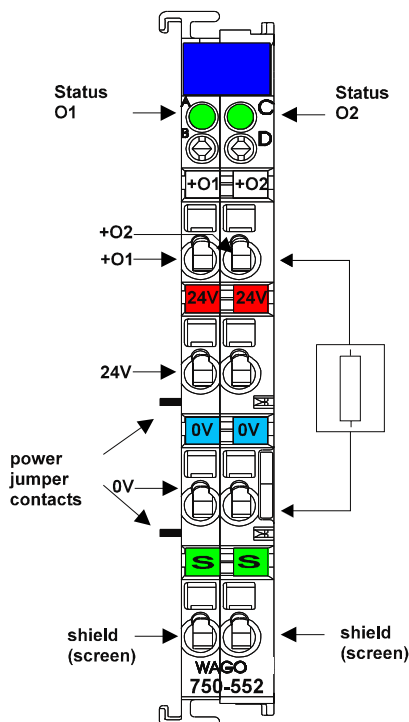
The numerical format for Siemens

In addition to the full 16 bit indication of the measured value it is possible to use the 'Siemens format'. The measured value is represented by the most significant 12 Bits. The 3 least significant Bits are reserved for diagnostic and status purposes. (750-580)

Output voltage 0-10 V	Binary value	Hex.	Dec.
> 10	0101 0000 0000 XXXX	50 01	20481
10	0100 0000 0000 XXXX	40 00	16384
7.5	0011 0000 0000 XXXX	30 00	12288
5	0010 0000 0000 XXXX	20 00	8192
2.5	0001 0000 0001 XXXX	10 08	4104
1.25	0000 1000 0000 XXXX	800	2048
0	0000 0000 0000 XXXX	0	0

If you have questions about the formatting of this data, please contact WAGO for I/O System technical support.

WAGO➡I/O➡SYSTEM

2 -Channel Analog Outputs 0-20 mA / 4-20 mA
PN 750-552, 554, 584

Status O1

Status O2

+O1 +O2

+O2
+O1

24V 24V

24V

0V 0V

0V

power jumper contacts

S S

shield (screen)

shield (screen)

WAGO
750-552

Technical Description

This description is only intended for hardware version X X X X 2 A 0 1 - - - -. The serial number can be found on the right side of the module.

The output signal of 750-552...555, 584 is a 0-10 mA or 4-20 mA signal. Sensors may be connected to „O" and to the common ground (0V).
The shield is connected to „S". The connection is made automatically when snapped onto the DIN rail.
Power connections are made automatically from module to module when snapped onto the DIN rail. For a self-supporting function, the power supply has to be connected by an input module (e.g. 750-602).

Attention:
The lowest power jumper contact is not carried out for some modules (e.g. 4-channel)! A module which needs all contacts (e.g. 2 channel digital) may not be connected to the right hand side of modules which do not have 3 power jumper contacts (e.g. 4 channel modules).

The output module can be connected to all buscouplers of the
WAGO═I/O═SYSTEM (except for the economy type).

Technical Data:

Item Number 750-	552	554	584
Number of channels	2		
Current consumption (internal)	60 mA max.		
Nominal voltage	24 V DC (-15% /+20%) via power jumper contacts		
Signal current	0-20mA	4-20mA	4-20mA
Resistance	<500 Ω		
Resolution	12 Bit		
Isolation	500 V system/power supply		
Bit width per channel	16 Bit Data, 8 Bit Control/Status		
Operating temperature	0°C....+55°C		
Configuration	none, optional via software parameter		
Wire connection	CAGE CLAMP; 0.08 to 2.5mm^2		
Dimensions (mm)WxHxL	12 x 64* x 100 (*from upper edge of carrier rail)		

The numerical format

All analog values will be shown in a unit numerical format. The following table will explain the numerical format. (750-552/554). The 3 LSBs are not taken into account.

| Output current 0-20	Output current 4-20	Binary Value	Hex.	Dec.
20	20	0111 1111 1111 1111	7F FF	32767
10	12	0100 0000 0000 0000	40 00	16384
5	8	0010 0000 0000 0000	20 00	8192
2.5	6	0001 0000 0000 0000	10 00	4096
0.156	4.125	0000 0001 0000 0000	01 00	256
0.01	4.0078	0000 0000 0001 0000	00 10	16
0.005	4.0039	0000 0000 0000 1000	00 08	8
0	4	0000 0000 0000 0111	00 07	7
0	4	0000 0000 0000 0000	0	0

The numerical format for Siemens

In addition to the full 16 bit indication of the measured value it is possible to use the 'Siemens format'. The measured value is represented by the most significant 12 Bits. The 4 least significant Bits have no function. (750-584)

Output current 4-20 mA	Binary value	Hex.	Dec.
20	0100 0000 0000 XXXX	40 00	16384
16	0011 0000 0000 XXXX	30 00	12288
12	0010 0000 0000 XXXX	20 00	8192
8	0001 0000 0000 XXXX	10 00	4096
4.015	0000 0000 0001 XXXX	00 10	16
4	0000 0000 0000 XXXX	00 00	0

If you have questions about the formatting of this data, please contact WAGO for I/O System technical support.

2 Channel Analog Outputs +/- 10 V
PN 750-556
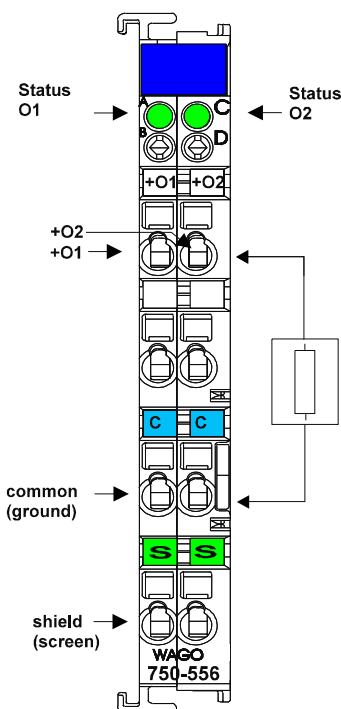
Technical Description

This description is only intended for hardware version X X X X 2 A 0 1 - - - -. The serial number can be found on the right side of the module.

The output signal of 750-556 is a +/- 10 V signal. Sensors may be connected to „O" and to the common ground (0V).

The shield is connected to „S". The connection is made automatically when snapped onto the DIN rail.
These I/O modules are not provided with integrated power jumper contacts. The power supply is made by the data contacts with a DC-DC converter. The modules can work self-supporting.

Attention:
The lowest power jumper contact is not carried out for some modules (e.g. 4-channel)!
A module which needs all contacts (e.g. 2 channel digital) may not be connected to the right hand side of modules which do not have 3 power jumper contacts (e.g. 4 channel modules).

The input module can be connected to all buscouplers of the **WAGO➠I/O➠SYSTEM** (except for the economy type)

WAGO➠I/O➠SYSTEM

Technical Data:

| Item Number 750-	556
Number of channels	2
Nominal voltage	via system voltage (DC DC converter)
Current consumption (internal)	65 mA
Signal voltage	+/- 10 V
Resistance	> 5 kΩ
Resolution	12 Bit
Isolation	500 V System/Power supply
Bit width per channel	16 Bit Data, 8 Bit Control/Status
Operating temperature	0°C....+55°C
Configuration	none, optional via software parameter
Wire connection	CAGE CLAMP; 0.08 to 2.5mm^2
Dimensions (mm)WxHxL	12 x 64* x 100 (*from upper edge of the carrier rail)

The numerical format

All analog values will be shown in a unit numerical format. The resolution is 12 Bits and the 3 LSBs are ignored. The following table will explain the numerical format.

Input voltage +/- 10 V	Binary Value	Hex.	Dec.
10	0111 1111 1111 1111	7F FF	32767
5	0100 0000 0000 0000	40 00	16384
2.5	0010 0000 0000 0000	20 00	8192
1.25	0001 0000 0000 0000	10 00	4096
0.0781	0000 0001 0000 0000	01 00	256
0.0049	0000 0000 0001 0000	00 10	16
0.0024	0000 0000 0000 1111	00 0F	15
0	0000 0000 0000 0000	0	00
-2.5	1110 0000 0000 0000	E0 00	57344
-5	1100 0000 0000 0000	C0 00	49152
-7.5	1010 0000 0000 0000	A0 00	40960
-10	1000 0000 0000 0000	80 00	32768

WAGO I/O SYSTEM

End module, Potential multiplication module, Separation module
PN750-600, 750-614, 750-616, 750-616/030-000
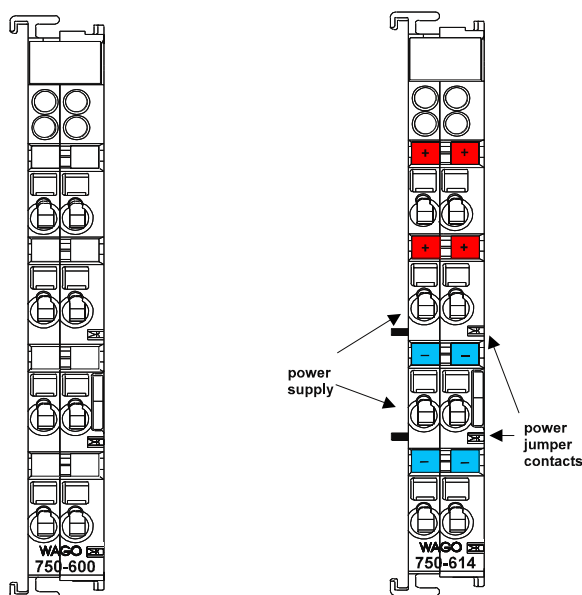
Technical Description

After the fieldbus node is assembled with the correct buscoupler and selected I/O modules, the end module is snapped onto the assembly. It completes the internal data circuit and ensures correct data flow.

The potential multiplication module allows additional + and - voltage connection points (up to 4 additional). This eliminates external terminal blocks.

Technical Data:

Item Number 750-	600	614
Voltage	-	24 V - 230 V AC/DC
Current on contacts	-	max. 10 mA
Operating temperature	0 °C ... + 55 °C	
Wire connection	CAGE CLAMP; 0,08 to 2,5 mm²	
Dimensions (mm) WxHxL	12 x 64 x 100, (from the upper edge of the carrier rail)	

WAGO I/O SYSTEM

Separation module

230 V AC

24 V DC
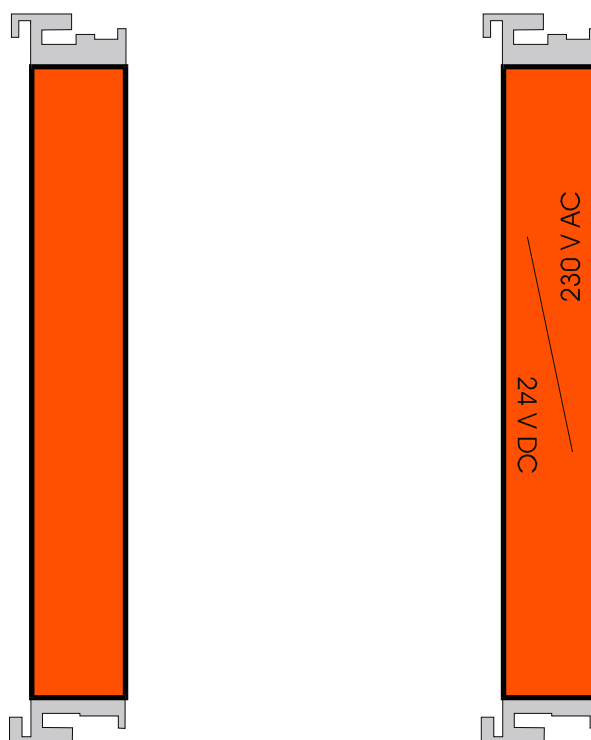
Technical description:

Use of this module allows increased air- and creepage distances between different field voltages within a node.

There are two different types of the separation module. With PN 750-616 you get a module without printing. PN 750-616/030-000 looks like the right one in the above picture.
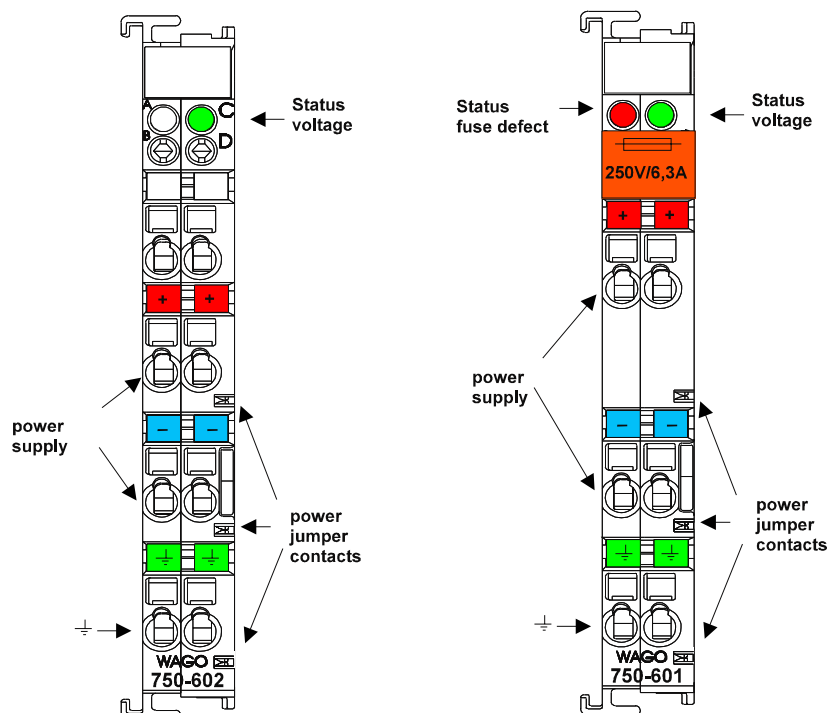
Technical Data:

Item No.	750-616, 750-616/030-000
Dimensions (mm) W x H x L	12 x 64* x 100, (*from the upper edge of the carrier rail)

WAGO➟I/O➟SYSTEM

Supply modules
PN750-601, 602, 609, 610, 611, 612, 613, 615

Technical Description

The supply module provides I/O module power through the power jumper contacts. Maximum current supply to all connected modules is 10 A. Maximum current supply to the modules with fuse holder is 6.3 A. Should higher currents be necessary, intermediate supply modules may be added in the assembly.

The modules 750-601, 609, 615, 610 and 611 are additionally equipped with a fuse holder. The change of the fuse is very easy by drawing out the fuse holder and changing the fuse. A blown fuse is indicated by a LED.

The modules 750-610 and 611 send information about the status of the supply module to the fieldbus coupler through two input bits.

Bit1	Bit2	Description
0	0	voltage < 15 V DC
1	0	fuse blown
0	1	fuse o.k., voltage o.k.

Using the supply modules you have to look for the allowed voltage. The following table shows the voltage for the supply modules.

The supply module 750-613 supplies the field side and te internal databus system voltage. The internal system voltage can supply 2 A max. If the sum of the internal current consumption exceeds 2 A, an additional supply module must be added.

WAGO ➠I/O➠SYSTEM

Technical Data:

Item Number 750-	602	612	613
Voltage	24 V DC	0 - 230 V AC/DC	24 V DC (-15%/+20%)
Current via contacts	max. 10 A		
Operating temperature	0 °C ... + 55 °C		
Wire connection	CAGE CLAMP; 0,08 to 2,5 mm²		
Dimensions (mm) W x H x L	12 x 64 x 100, (from the upper edge of the carrier rail)		

internal current 750-613: max. 2 A

Item Number 750-	601	609	615
Voltage	24 V DC	230 V AC	120 V AC
Current via contacts Fuse	max. 6.3 A 5 x 20, 6.3 A		
Operating temperature	0 °C ... + 55 °C		
Wire connection	CAGE CLAMP; 0,08 to 2,5 mm²		
Dimensions (mm) W x H x L	12 x 64 x 100, (from the upper edge of the carrier rail)		

| Item Number 750-	610	611
Number of inputs	2	
Current consumption	5 mA	
Internal bitwidth	2	
Voltage	24 V DC	230 V AC
Current via contacts Fuse	max. 6.3 A 5 x 20, 6.3 A	
Operating temperature	0 °C ... + 55 °C	
Wire connection	CAGE CLAMP; 0,08 to 2,5 mm²	
Dimensions (mm) W x H x L	12 x 64 x 100, (from the upper edge of the carrier rail)	

Binary spacer module
PN 750-622

Number of inputs or outputs
Inputs or Outputs

24V

0V
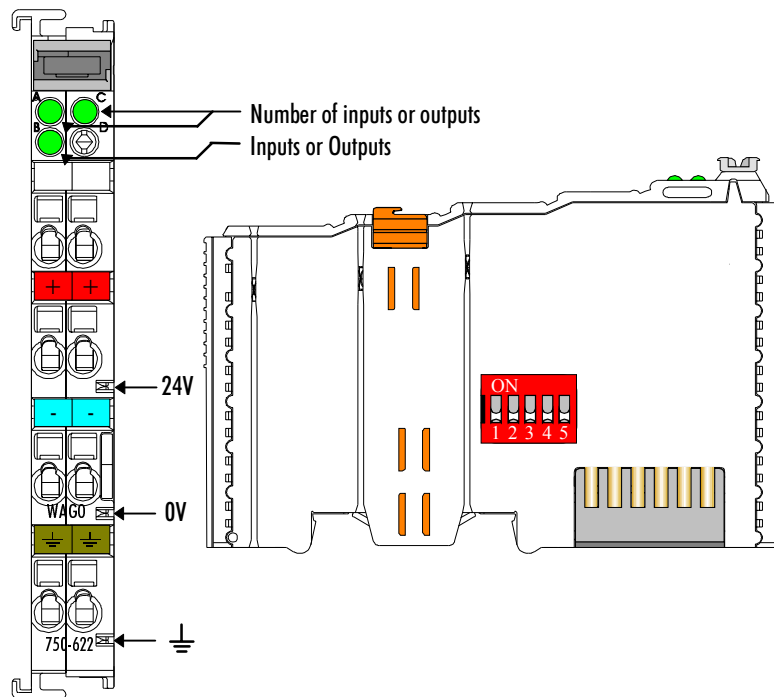
Technical description

The binary spacer module reserves bit-addresses in the WAGO buscoupler.
The number of in or outputs can be chosen by two DIP switches. 2, 4, 6 or 8 bits are possible (1, 2, 3 or 4-channel modules). A third DIP Switch chooses inputs or outputs. The kind of configuration is indicated by means of 3 LEDs even if there is no voltage applied.
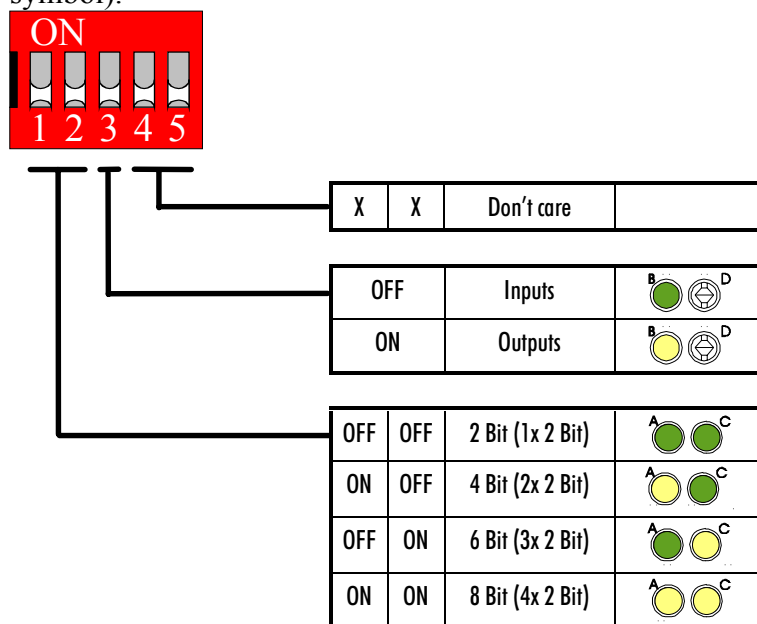
The binary spacer module works like a supply module. The power supply must be made for the following modules.
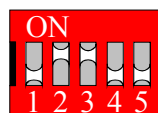
WAGO⇓I/O⇓SYSTEM

Technical Data

Item number 750-	622
Number of in- or outputs	2, 4, 6 or 8
Nominal voltage	5 V DC internal
Internal current consumption	10 mA max.
Voltage (field side)	24 V DC (-15%/+20%)
Current via power jumper contacts	10 A max.
Input current (field side)	-
Isolation	500 V system/power supply
Internal bit width	2, 4, 6 oder 8
Configuration	none, optional via software parameter
Operating temperature	0°C....+55°C
Wire connection	CAGE CLAMP; 0.08 to 2.5mm^2
Dimensions (mm) WxHxL	12 x 64* x 100 (*from upper edge of the carrier rail)

The DIP switches and LEDs are used as fol lows. When the switch is OFF the LED is also OFF (dark g reen symbol). When the switch is ON the LED lightens (yellow symbol).

X	X	Don't care	

OFF	Inputs	
ON	Outputs	

OFF	OFF	2 Bit (1x 2 Bit)	
ON	OFF	4 Bit (2x 2 Bit)	
OFF	ON	6 Bit (3x 2 Bit)	
ON	ON	8 Bit (4x 2 Bit)	

Examples:

 6 binary outputs (3x 2-channel output modules)

 4 binary inputs (2x 2-channel input modules)

WAGO⇓I/O⇓SYSTEM

SSI Encoder Interface
PN 750-630, 750-630/000-001, 750-630/000-006
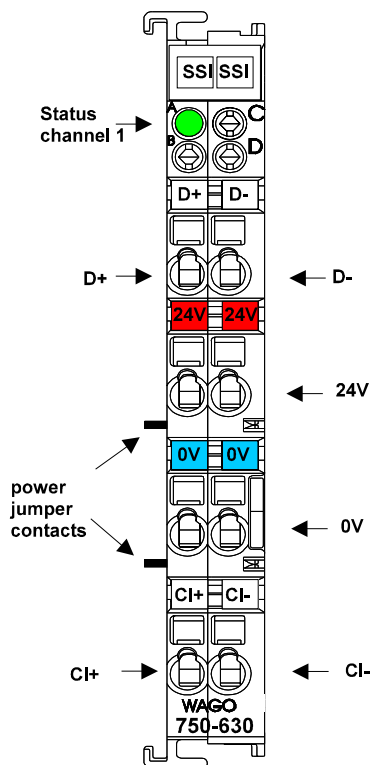
Technical Description:

This technical description is only valid for hardware and software versions
X X X X 2 B 0 2----. The product series number is printed on the right side of the
module.

The operational mode of the module is factory preset to discern a 24 bit absolute
encoder Graycode signal transmitted at 125kHz.

The following description is preliminary and is applicable to the factory configuration.

Attention:
The lowest power jumper contact is not carried out for some modules (e.g. 4-channel)!
A module which needs all contacts (e.g. 2 channel digital) may not be connected to the
right hand side of modules which do not have 3 power jumper contacts (e.g. 4 channel
modules).

The SSI Interface is able to run with all WAGO➡I/O➡SYSTEM bus-couplers (except
for the economy type).

WAGO➡I/O➡SYSTEM

Technical Data:

Series 750	630	630/000-001	630/000-006
Encoder connections	Data Input: D+; D-; Clock Output: CI+; CI-		
Current consumption (internal)	85mA typ.		
Power supply	24V DC (-15%/+20%)		
Sensor power supply	24V DC via power jumper contacts		
Baud rate	max. 1 MHz		
Data field width	32 Bit		
Signal output (clock)	differential RS 422		
Signal input (positional)	differential RS 422		
Output data format	Graycode / Dualcode		
Bit width	32 Bit: Data; 8 Bit: Control/Status		
Configuration	none, optional via software parameter		
Signal isolation	500 V system/power supply		
Temperature range	0°C....+55°C		
Wire connection	CAGE CLAMP; 0.08 x 2.5mm^2 AWG 28-14		
Dimensions (mm) WxHxL	12 x 64* x 100 (*from upper edge of carrier rail)		
Default Configuration	125 kHz Graycode 24 Bit Data Resolution	125 kHz Binary 24 Bit Data Resolution	250 kHz Graycode 24 Bit Data Resolution

Terminal Configuration:

Input	Type	Function
Signal D+ and Signal D-	Input, RS422	Positional data from encoder, Graycode.
Signal Cl+ and Signal CL-	Output, RS422	Clock signal output for communications interface.
+24 V DC	Input	24 V DC supply voltage to module, field connection.
0 V DC	Input	0 V DC supply voltage return to module, field connection.

The use of this module in conjunction with a SSI encoder provides direct positional information rather than the type of data resultant from incremental type encoders. Absolute encoders are comprised of several data disks which generate a data word which is unique through out the 360 degrees of rotation. The data format is a modified binary pattern in either Graycode or Dualcode.

The resolution of the sensor depends upon the configuration of the sensor and the physical number of revolutions in the motion profile. Since the basis of the encoder is to provide absolute positional information based upon a mechanical configuration limited to one revolution or less. The maximum resolution of this module is 24 bit.

The frequency of the data signal input to the SSI module is maintained at 125 kHz. Listed below are the recommended cable lengths for the various clock signal Baud rates.

Baud rate	Maximum cable length
100 kHz	400 meters
200 kHz	200 meters
300 kHz	100 meters
400 kHz	50 meters

Organization of the in- and output data for Interbus

The module is seen like an analog input with 2 x 16 Bit input data.

Inputs:

Word	Data Word Designation	
D0 (Bit 0-15)	Positional data, Input byte 1	Positional data, Input byte 0
D1 (Bit 16-31)	Positional data, Input byte 3	Positional data, Input byte 2

WAGO➟I/O➟SYSTEM

Quadrature Encoder Interface
PN 750-631, 750-631/000-001
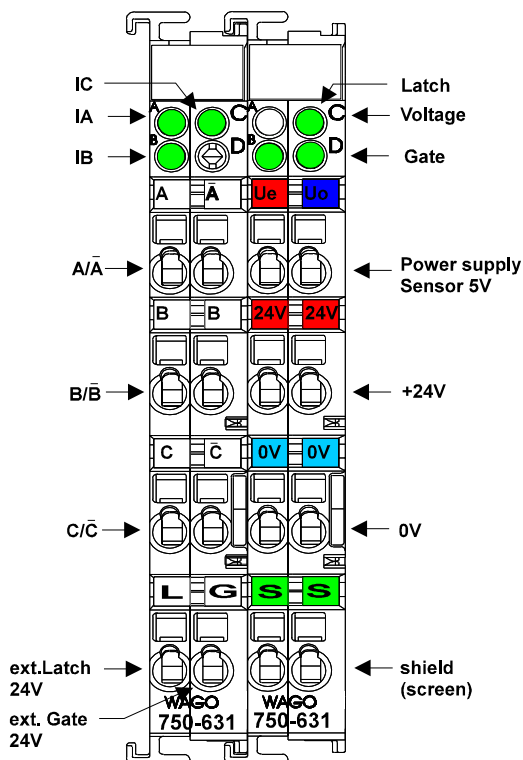
Technical Description:

This technical description is only valid for hardware and software versions X X X X 2 B 0 1----. The product series number is printed on the right side of the module.

The described operational mode is 4 times or quadrature sampling.

The following description is preliminary and is applicable to the factory configuration.

Attention:
The lowest power jumper contact is not carried out for some modules (e.g. 4-channel)! A module which needs all contacts (e.g. 2 channel digital) may not be connected to the right hand side of modules which do not have 3 power jumper contacts (e.g. 4 channel modules).

The Quadrature Encoder Interface is able to run with all WAGO➟I/O➟SYSTEM bus-couplers (except for the economy type).

WAGO➟I/O➟SYSTEM

Technical Data:

Series 750-	631	631/000-001
Encoder connections	A, A(inv.); B, B(inv.); Index, Index(inv.)	
Current consumption (internal)	25 mA	
Sensor supply voltage	5 V DC	
Data word	16 Bit Binary	
Maximum frequency	1 MHz	
Counter modes	1-2-4 times sampling	
Data latch word	16 Bit	
Commands	read, reset, start	
Supply voltage	24 V DC (-15%/+20%)	
Current consumption	85mA Field (without sensor)	
Sensor	0.1 A (without sensor load)	
Bit width	1 x 32 Bit: Data; 8 Bit:Control/Status	
Configuration	none, optional via software parameter	
Operational temperature	0°C....+55°C	
Wire connection	CAGE CLAMP; 0.08 x 2.5mm^2 AWG 28-14	
Dimensions (mm) WxHxL	24 x 64* x 100 (*from upper edge of the carrier rail)	
Default configuration	4 times sampling	1 time sampling

Operational Characteristics:

The quadrature encoder interface accepts up to two input signals for the counting increment. The index pulse may also be considered should the control configuration require. There is also a Latch and Gate input available on the module for added functionality.

The quadrature encoder provides two signals that are shifted 90 degrees from each other, signals A and B. In order to achieve a better common mode noise rejection ratio, the output signals from the encoder are transmitted via a differential signal. Their complement signals, A(inv.) and B(inv.) are also transmitted. A directional determination may be made by which signal leads. If the A signal leads, the direction is considered to be forward. If the B signal leads, the direction is considered to be reverse. By exchanging the A and A(inv.) the phase relationship will be changed by 180 degrees, thus allowing the direction to be preset via the wiring configuration.
Most quadrature encoders have an Index signal, or Z rev, as well as the incremental signal. This signal provides one pulse per revolution with a duration equal to an incremental pulse.

The inputs to the quadrature encoder module must be supplied from an encoder with Line Driver Outputs for proper operation. The 5 Volt DC output may be used to power the encoder. The 24 Volt DC input supply must be provided from an external power supply.
The Gate and Latch inputs are 24 Volt DC.

Module Inputs and Outputs

Connection	Type	Function
Signal A and Signal A(inv.)	Input, TTL	Incremental pulse signals for channel A
Signal B and Signal B(inv.)	Input, TTL	Incremental pulse signals for channel B
Signal C and Signal C(inv.)	Input, TTL	Index pulse signals
Shield	Input	Shield connection for encoder wiring
Sensor 0V DC	Output	Supply return for encoder supply
Sensor +5V DC	Output	5 Volt DC supply for encoder
+24V DC	Input	24 Volt DC supply, field connection
0V DC	Input.	Supply return, field connection
Gate	Input, 24V DC	24 Volt DC input for gate signal
Latch	Input, 24V DC	24 Volt DC input for Latch signal

The Input Gate stops the counter. Only 0 V or an open connection initialize the counter. 24 V stops the counting process.

The input Latch controls the overtaking of the actual counter value into the Latchregister. This input is activated by teh control bit EN_LATEXT („1"). EN_LACT has to be deactivated („0"). The first change from 0 V to 24 V at the Latch input takes the actual counter value into the Latchregister.
The control byte contains the information as listed below.

Control Byte Configuration							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	x	CFAST_M	x	x	CNT_SET	EN_LATEXT	EN_LATC
0	x	Operation Mode	x	x	Counter Set	Release Latch	Release Index Pulse

Please note Bit 7 is a reserved bit and must always be set to 0. It is responsible for register communication which is not decribed in this chapter.

Bit	Function
CFAST_M	Fast mode operation. Only the counter module function will be operable. All other control bits will be ignored.
CNT_SET	The counter module will be preset to a count value with a rising edge.
EN_LATEXT	0=The external latch input is deactivated. 1=The module will latch in the counter data on the first rising edge. Other changes have no effect.
EN_LACT	0=Latching data with the Index pulse is deactivated. 1=The Index pulse will latch in the counter data on the first rising edge. Other changes have no effect.

The status byte contains the information as listed below.

Status Byte Configuration							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	x	x	OVERFLOW	UNDERFLOW	CNTSET_ACC	LATEXT_VAL	LATC_VAL
0	x	x	Counter Overflow	Counter Underflow	Counter Set Acknowledge	External Latch Ack.	Latched Data Set

Bit	Function
OVERFLOW	The Overflow bit will be set if the counter value rolls over from 65535 to 0. This bit will automatically be reset if the counter passes through more than one third of the count range, 21845 to 21846, or if an Underflow occurs.
UNDERFLOW	The Underflow bit will be set if the counter value rolls back from 65535 to 0. This bit will automatically be reset if the counter passes through more than two thirds of the count range, 43690 to 43689, or if an Overflow occurs.
CNTSET_ACC	The Counter Set Acknowledge but is set when a valid counter value is preset to the module.
LATEXT_VAL	The Latch External Valid Acknowledge bit is set when a counter value is latched into the module via the Latch input.
LACT_VAL	The Latch Index Pulse Valid Acknowledge bit is set when a counter value is latched into the module via the Index pulse.

WAGO➡I/O➡SYSTEM

It is possible to process and/or check the below listed actions via the control and status bits.

Extending the 16 bit counting range: The internal counting range is 16 bits or a maximum value of 65535. Should the application require an extended count range the location-difference-integration method may be employed. This method uses the control system to store the interrogated counter value. Any new interrogated value will have the previously stored counter value subtracted from it. This value will then be added to an accumulated register value. It is assumed that the counter difference of the two interrogated values is smaller than 16 bits therefore overflows need not be considered.

Another method calculates the extended counter range via the underflow and overflow status bits. The interrogated value is either added or subtracted to the accumulation register depending upon the status of the overflow or underflow bits.

Set Counter Position: The presetting of the counter is possible via the CNT_SET bit. The desired preset is loaded into the data register and the CNT_SET bit is set from 0 to 1. The CNTSET_ACC bit will be set to 1 when the preset value is loaded into the count register.

Maintaining the Present Counter Position: The counter present value may be maintained or latched via the external Latch input. First the external latch must be enabled via the EN_LATEXT bit. Once the input is enabled, the data will be latched into the counter module upon a 0 to 1 transition. Upon completion of the latch process the external latch valid bit LATEXT_VAL will be set to 1.

Maintaining a Reference Point: The storage of a present counter value may also accomplished via the Index pulse from the encoder. First the index latch enable bit must be set, EN_LACT, to a value 1. The counter present value will be latched upon the low to high transition of the Index input. Upon completion of the data latch process the Index Latch Valid bit, LACT_VAL will be set to 1.

WAGO➠I/O➠SYSTEM

Organization of the in- and output data for Interbus

The module is seen like an analog module with 3 x 16 Bit input and output data.

Outputs:

Word	function	
D0 (Bit 0-15)	control byte	set counter-Byte1
D1 (Bit 16-31)	set counter-Byte0	
D2 (Bit 32-47)		

Inputs:

Word	function	
D0 (Bit 0-15)	Statusbyte	counter byte 1
D1 (Bit 16-31)	counter byte 0	
D2 (Bit 32-47)	Latch value-Byte1	Latch value-Byte0

WAGO I/O SYSTEM

RS232C Interface, TTY Interface -20 mA Current Loop
RS485C Interface
PN 750-650, 750-651, 750-653, 750-650/000-001
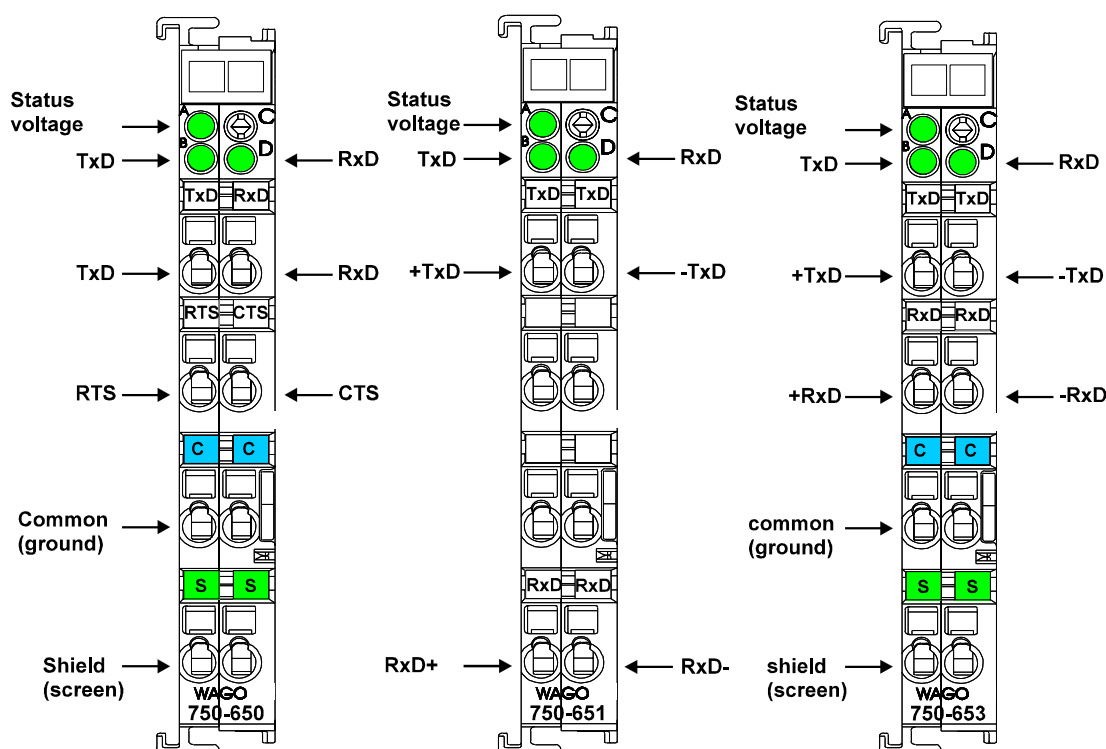
Technical Description:

This technical description is only valid for hardware and software versions X X X X 2 C 0 3----. The product series number is printed on the right side of the module.
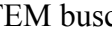
The operational mode described below is the presetting.

The following description is preliminary and is applicable to the factory configuration. Many other operational modes are possible (please contact WAGO for the corresponding settings).

Attention:
Some modules do not provide all power jumper contacts (e.g. 4-channel)! A module which needs all contacts (e.g. 2 channel digital) cannot be connected to the right hand side of modules which do not have 3 power jumper contacts.

The interface module is able to run with all WAGO➡I/O➡SYSTEM buscouplers (except for the economy type).

WAGO➡I/O➡SYSTEM

Technical Data:

Series 750-	650,650/000-001	651	653
Transmission channel	2 (1/1), T x D and R x D, full duplex		2, autom. Send/Receive
Transmission rate	1200 - 19200 baud		
Bit skew	< 3 %	-	-
Bit transmission	-	2 x 20 mA passive	acc. to ISO 8482/ DIN 66259 T 4
Resistance	-	< 500 Ω	-
Current consumption (internal)	50 mA max.		
Transmission length	max. 15 m RS 232 cable	max. 1000 m twisted pair	max. 500 m twisted pair
Input buffer	128 bytes		
Output buffer	16 bytes		
Voltage supply	via internal system supply		
Isolation	500 V System/Supply		
Bit width internal	1 x 40 bit, 1 x 8 bit Control/Status		
Configuration	none, parameter configuration with software		
Operating temperature	0 °C ... + 55 °C		
Wire connection	CAGE CLAMP; 0,08 bis 2,5 mm²		
Dimensions(mm) W x H x L	12 x 64* x 100 (*from upper edge of the carrier rail)		
Factory preset Baud rate Bit width internal	9600 baud 1 x 24 bit in/out, 1 x 8 bit Control/Status		

Description of RS 232:

The interface module is designed to operate with all WAGO I/O fieldbus couplers. The serial interface module allows the connection of RS 232-Interface devices to the WAGO I/O SYSTEM. The RS 232 Interface module can provide gateways within the fieldbus protocol. This allows serial equipment such as printers, barcode readers, and links to local operator interfaces to communicate directly by the fieldbus protocol with the PLC or PC Master.
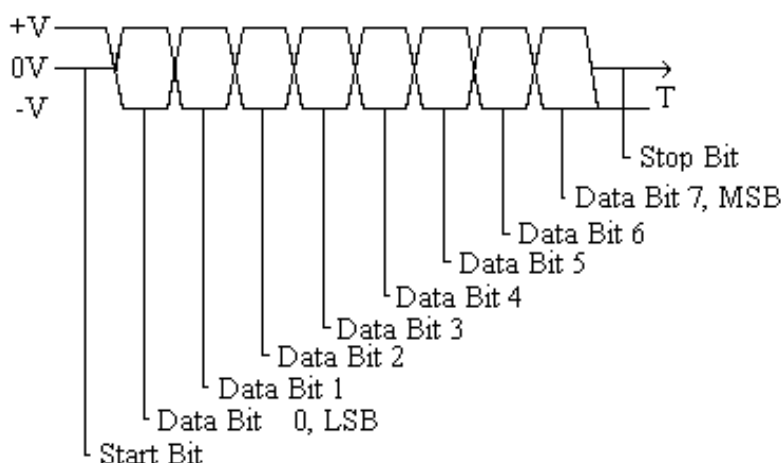
This module supports no higher level of protocol. Communication is made completely transparent to the fieldbus allowing flexibility in further applications of the serial interface module. The communication protocols are configured at the Master PLC or PC.

The 128 byte input buffer provides for high rates of data transmission. When using lower rates of transmission speed you can collect the received data, with less priority, without loosing data.

The 16 byte output buffer provides for faster transmission of larger data strings.

FUNCTION The data transmission takes place at 9.600 baud (default value). 1 startbit, 8 databits and 1 stopbit will be transmitted. No parity is available. The user controls data via the RTS and CTS signals. These signals are generated in the module depending on the loading status of the buffers. These controls can be deactivated by means of an external jumper. RTS and CTS are to be connected.

For testing purposes the Windows 3.11 terminal emulation can be used. A cable with a 9-pole sub-D socket is required. Pin 5 is connected to input M. Pin 2 is connected to TxD and Pin 3 to RxD. RTS and CTS of the module are connected. A hardwarehandshake between terminal emulation and SPS is not possible though.

Figure 2: Data Word Signal
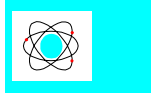
Description of TTY:

The interface module is designed to operate with all WAGO I/O fieldbus couplers. The TTY interface module allows the connection of TTY-Interface devices to the WAGO I/O SYSTEM. The TTY Interface module can provide gateways within the fieldbus protocol. This allows serial equipment such as printers, barcode readers, and links to local operator interfaces to communicate directly by the fieldbus protocol with the PLC or PC Master.

This module supports no higher level of protocol. Communication is made completely transparent to the fieldbus allowing flexibility in further applications of the serial interface module. The communication protocols are configured at the Master PLC or PC.

The 128 byte input buffer provides for high rates of data transmission. When using lower rates of transmission speed you can collect the received data, with less priority, without loosing data.

The 16 byte output buffer provides for faster transmission of larger data strings.

FUNCTION

The data transmission takes place at 9600 baud (default value). 1 startbit, 8 databits and 1 stopbit will be transmitted. No parity is available. The drivers are high ohmic. The control of data is made by the user software.

The TTY Interface is passive in sending and receiving , thus having no current sources. For data conversion an active partner is needed or an additional current source has to be connected.

point to point connection with active partners

point to point connection with passive partners and additional current sources

bus connection with a current source and a passive module

Description of RS 485:

The interface module is designed to operate with all WAGO I/O fieldbus couplers. The serial interface module allows the connection of RS485 or RS488-Interface devices to the WAGO I/O SYSTEM. The RS485/RS488 Interface module can provide gateways within the fieldbus protocol. This allows serial equipment such as printers, barcode readers, and links to local operator interfaces to communicate directly by the fieldbus protocol with the PLC or PC Master.

This module supports no higher level of protocol. Communication is made completely transparent to the fieldbus allowing flexibility in further applications of the serial interface module. The communication protocols are configured at the Master PLC or PC.

The 128 byte input buffer provides for high rates of data transmission. When using lower rates of transmission speed you can collect the received data, with less priority, without loosing data.
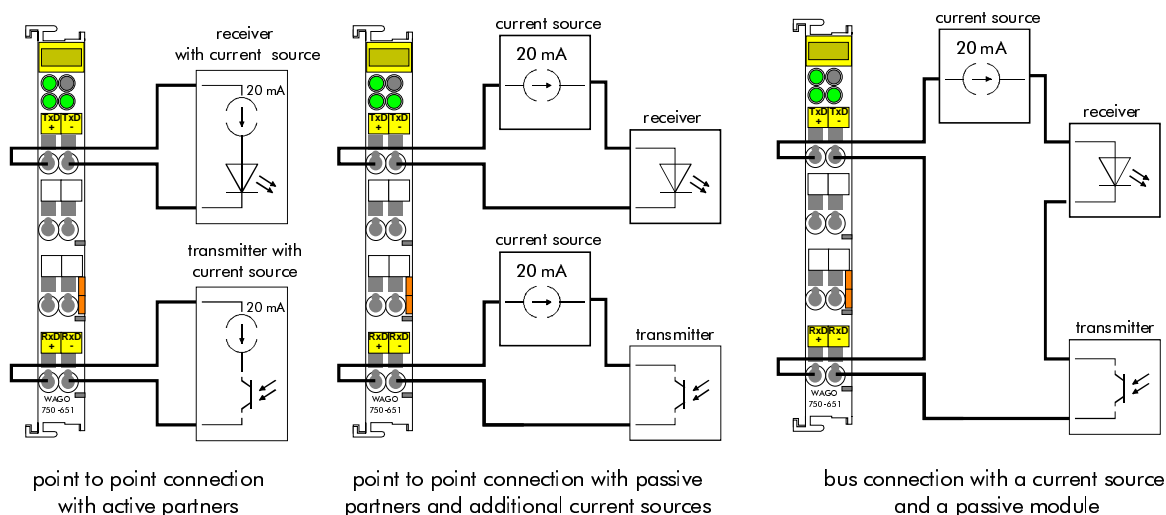
The 16 byte output buffer provides for faster transmission of larger data strings.

FUNCTION The data transmission takes place at 9,600 baud (default value). 1 startbit, 8 databits and 1 stopbit will be transmitted. No parity is available. The drivers are high ohmic. The control of data is made by the user software.

The interface module can be used for bus connections as well as for point to point connections. With bus connections, *modules that are not connected to the power supply* can also be wired. They do not disturb the bus connection.
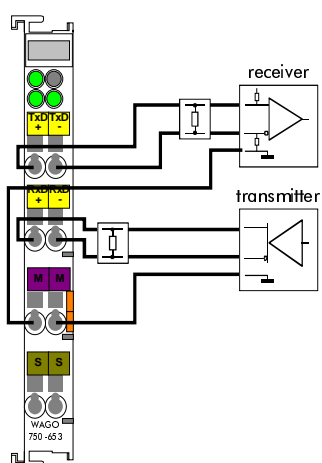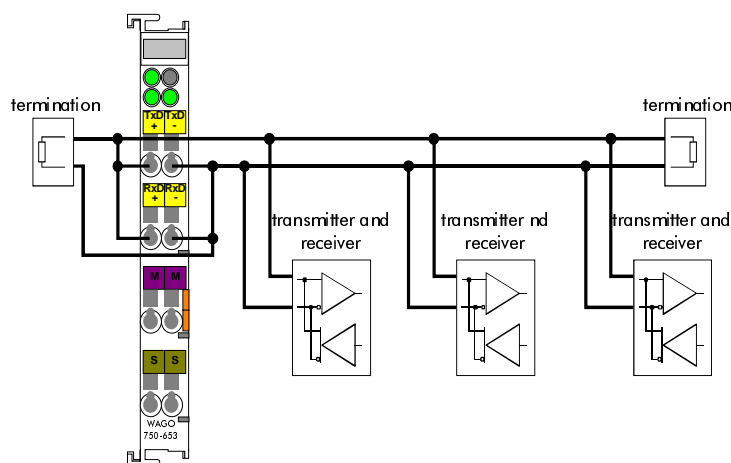
point to point connection   bus connection

Structure of input and output data:

The module is a combined analog input and output module with 2 x 16 bit input and output data. The transfer of the data to be transmitted and the received data is made via up to 3 output and 3 input bytes. One control byte and one status byte are used to control the floating data.
Requests are indicated by a change of a bit. An assigned bit indicates execution by adopting the value of the request bit.

Up to 3 characters which have been received via interface can be stored in the input bytes 0 to 2. The output bytes will contain the characters to be sent.

The control byte consists of the following bits:

Control Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	OL2	OL1	OL0	0	IR	RA	TR
Con-stant value must always be 0.	Frames available in output area, OL2 is always 0. eg. OL2, OL1, OL0 = 0,1,1 3 characters should be sent and put into the output.			Constant value must always be 0.	Initialization request	Reception acknow-ledgement	Trans-mission request

The status byte consists of the following bits:

Status Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	IL2	IL1	IL0	BUF_F	IA	RR	TA
Con-stant value must always be 0.	Frames available in input area, IL2 is always 0. eg. IL2,IL1,IL0 = 0,1,0 2 characters were received and reside in input 0 and input 1.			Input buffer is full.	Initialization acknow-ledgement	Reception request	Trans-mission acknow-ledgement

WAGO➡I/O➡SYSTEM

The PLC is able to control transmission and reception of data by means of the control byte and the status byte.

Initialization of the module:

- set IR in the control byte
- transmit/receive functions are blocked
- output/input buffers are erased
- serial interface module will load its configuration data

Transmitting data:
- TR≠TA: put characters into output byte 0 to 2
- amount of characters is specified in OL0 to OL2
- TR is inverted and read out
- characters are put into output buffer if TR=TA

Receiving data:
- RR≠RA: in input byte 0 to 2 characters are available
- amount of characters is specified in IL0 to IL2
- charactersin IL0 to IL2 are read out
- RA is inverted and read out
- all characters are read when RR=RA

The transmitting and receiving of data can be done simultaneously. The initialization request has prioirity and will stop transmitting and receiving of data immediately.

Message: input buffer full (Bit 3)
Input buffer is full. Data which are received now are lost.

Examples:

The module is initialized.

- The initialization bit in the control byte is set.

Output byte 0	Control byte	Output byte 2	Output byte 1
0x00	0000.0100	0x00	0x00

- After the initialization has been executed, the status byte will give back 000.0100.

Input byte 0	Status byte	Input byte 2	Input byte 1	
XX	0XXX.X0XX	XX	XX	Module is still being reset
XX	0XXX.X1XX	XX	XX	Initialization completed

Sending of the data string "Hello":

- The first 3 characters and the buffer length of 3 are transmitted.

Output byte 0	Control byte	Output byte 2	Output byte 1
'H' (0 x 48)	0011.0000	'l' (0 x 6C)	'e' (0 x 65)

- The transmission request bit (TR) is inverted.

Output byte 0	Control byte	Output byte 2	Output byte 1
'H'	0011.0001	'l'	'e'

- As soon as TR=TA, the rest of the data can be sent.

Input byte 0	Status byte	Input byte 2	Input byte 1	
XX	0XXX.XXX 0	XX	XX	The data is still being transferred.
XX	0XXX.XXX 1	XX	XX	Data transfer completed.

- The last 2 characters and the buffer length of 2 are transmitted.

Output byte 0	Control byte	Output byte 2	Output byte 1
'l'	0010.0001	XX	'o' (0 x 6F)

- The transmission request bit (TR) is inverted.

Output byte 0	Control byte	Output byte 2	Output byte 1
'l'	0010.0000	XX	'o'

- As soon as TA = TR, the data has been transferred to the output buffer.

Input byte 0	Status byte	Input byte 2	Input byte 1	
XX	0XXX.XXX1	XX	XX	The data is still being transferred.
XX	0XXX.XXX0	XX	XX	Data transfer completed.

Receiving the character chain "WAGO"

- As soon as RA≠RR, the input bytes contain data.

Output byte 0	Control yte	Output byte 2	Output byte 1
XX	0XXX.000X	XX	XX

Input byte 0	Status byte	Input byte 2	Input byte 1	
XX	0XXX.0X0X	XX	XX	No received data available.
'W' (0 x 57)	0011.0X1X	'G' (0 x 47)	'A' (0 x 41)	The information is in the input bytes.

- After the 3 characters have been processed, RA is inverted.

Output byte 0	Control byte	Output byte 2	Output byte 1
XX	0XXX.001X	XX	XX

- If RA≠RR, the receiving of additional characters will continue.

Input byte 0	Status byte	Input byte 2	Input byte 1	
XX	0XXX.0X1X	XX	XX	No received data available.
'O' (0 x 4F)	0001.0X0X	XX	XX	The information is in the input bytes.

- After the characters have been processed, RA is inverted.

Output byte 0	Control byte	Output byte	Output byte
XX	0XXX.000X	XX	XX

Notes:

0 x 23 is a hexadecimal value
0101.1001 is a binary value
An X indicates that this particular value has no importance.
XX indicates that the whole value has no importance.

Status Indicators:
The 3 green LEDs have the following function:

Function	Non-Function
Output Status TxD	Input Status RxD

Structure of the in and output data for Interbus

The module is a combined input and output module with 2 x 16 bit input and output data.

Outputs:

Word	Description	
D0 (bit 0-15)	Output byte0	Control byte
D1(bit16-31)	Output byte2	Output byte1

Inputs:

Word	Description	
D0 (bit 0-15)	Input byte0	Status byte
D1(bit16-31)	Input byte2	Input byte1

The RS232 module is also available with a data format of 5 bytes (item-no. 750-650/000-001).

Outputs:

Word	Description	
D0 (bit 0-15)	Control byte	Output byte0
D1(bit16-31)	Output byte1	Output byte2
D2(bit32-47)	Output byte3	Output byte4

Inputs:

Word	Description	
D0 (bit 0-15)	Status byte	Input byte0
D1(bit16-31)	Input byte1	Input byte2
D2(bit32-47)	Input byte3	Input byte4

WAGO I/O SYSTEM

Data exchange module
PN 750-654
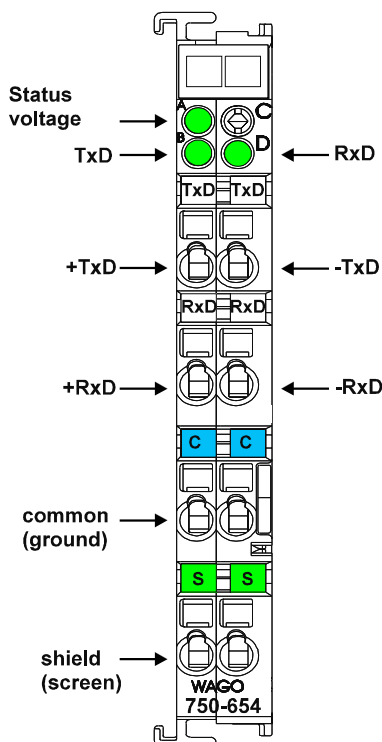
Status voltage

TxD

RxD

+TxD

-TxD

+RxD

-RxD

common (ground)

shield (screen)

WAGO 750-654

Technical Description

This technical description is only valid for hardware and software versionx X X X X 2 C 0 0 - - - -. The product series number is printed on the right side of the module.

The operational mode described below is for the factory preset mode.

The following description is preliminary and is applicable to the factory configuration. Many other operational modes are possible (please contact WAGO for the corresponding settings.)

⚠️ **Attention:**
Some modules do not provide all power jumper contacts (e.g. 4-channel)! A module which needs all contacts (e.g. 2-channel digital) cannot be connected to the right hand side of modules which do not have 3 power jumper contacts.

The data exchange module is able to run with all **WAGO I/O SYSTEM** buscouplers (except for the economy type).

Technical Data

| Series 750-	654
Transmission channel	TxD and RxD, full duplex, 2 channel
Transmission rate	62500 Baud
Bit transmission	via 2 twisted pair with differential signals
Resistance of cable	120 Ω
Current Consumption (internal)	65 mA max.
Transmission length	max. 100 m twisted pair
Input buffer	128 Byte
Output buffer	16 Byte
Voltage supply	via internal system
Isolation	500 V System/Supply
Bit width internal	1 x 40 bits, 1 x 8 bits control/status
Configuration	none, parameter configuration with software
Operating temperature	0 °C ... + 55 °C
Wire connection	CAGE CLAMP; 0.08 to 2.5 mm²
Dimensions (mm) W x H x L	12 x 64* x 100 (*from upper edge of the carrier rail)
Factory preset internal bit width	1 x 32 bits in/out, 1 x 8 bits control/status

WAGO➟I/O➟SYSTEM

Description of data exchange module

The data exchange module allows the exchange of 4 (5) bytes between different fieldbus systems via multiplexing of a serial connection. The delay which is caused by the multiplexor is < 5ms. The integrated watchdog function switches all outputs to zero if there is no valid information for more than 200 ms via the multiplex connection.

The 128 bytes input buffer provides for high rates of data transmission. When using lower rates of transmission speed you can collect the received data, with less priority, without loosing data.
The 16 byte output buffer provides for faster transmission of larger data strings.

The data exchange module is connected peer-to-peer. For the wiring of the serial multiplex connection the RxD and TxD cables are crossed. The following illustrations show the peer-to-peer connection and the internal structure of the data exchange module.
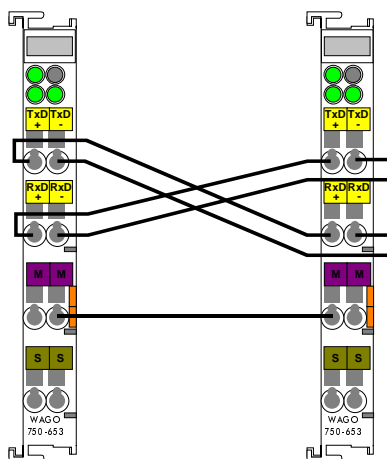
peer-to-peer connection
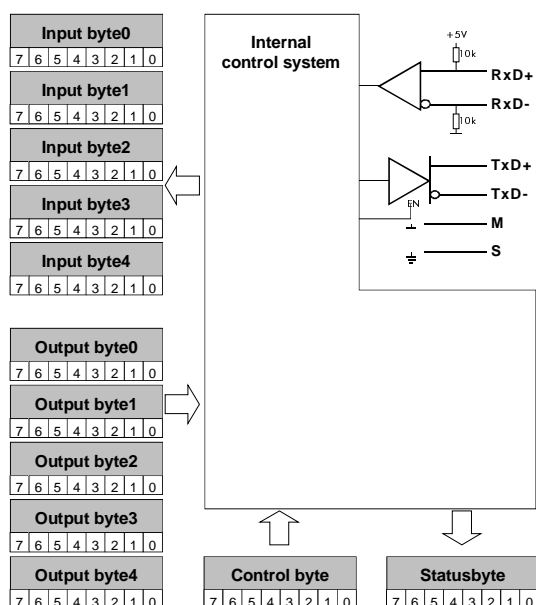
WAGO➡I/O➡SYSTEM

Structure of input and output data:

The module is a combined special function input and output module with 1 x 32 (40) Bit input and output data. The tranfer of the data to be transmitted and the received data is made via up to 5 input and 5 output Bytes. One control byte and one status byte are used to control the floating data.

The control byte consists of the following bits:

Control byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0							
Constant value always must be 0							

The status byte consists of the following bits:

Status byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0			RCVT1	RCVT2	CHK	OVR	PAR
Constant value always must be 0.			Module is in timeout. All output bits are set to 0 (watchdog).	The receiver is in timeout.	Checksum error.	Buffer overflow	Pariry error or wrong data in a frame.

The PLC is able to control transmission and reception of data by means of the control byte and the status byte.

Control of the multiplex connection: In the process image of the transmitting buscoupler one Bit is set to „1" for the whole time. As long as this Bit is „1" in the receiving coupler, further input Bits can be evaluated. If the Bit is „0" the multiplex connection has been disrupted. The further Bits are also 0 because of the watchdog.

Control of the multiplex connection with acknowledge: If the transmitting buscoupler gets an acknowledge from the receiving buscoupler, the received bit must be transfered as an output bit to the process image. The transmission is successful as long as the Bit is „1".

Handshake: If a serial data exchange should be made with the data exchange module, the handshake can be made via „Toggle Bits". Therefore an input bit and an output bit are reserved. As soon as those bits are different from each other, a request from the opposite module is made. As soon as the request is executed the output bit is toggled.

Structure of the in- and output data for Profibus (from firmware WH)

The ID 179 (hex: 0xB3), (Data consistence over 4 Byte) is used.

Outputs

Byte	Description
D0	Output byte0
D1	Output byte1
D2	Output byte2
D3	Output byte3

Inputs

Byte	Description
D0	Input byte0
D1	Input byte1
D2	Input byte2
D3	Input byte3

For the ID 188 (hex.: 0xBC), Data consistence over 6 Byte is used, input and output data are now as follows:

Outputs

Byte	Description
D0	Control byte
D1	Output byte0
D2	Output byte1
D3	Output byte4
D4	Output byte2
D5	Output byte3

Inputs

Byte	Description
D0	Statusbyte
D1	Input byte0
D2	Input byte1
D3	Input byte4
D4	Input byte2
D5	Input byte3

☞ For a S7 PLC the function code SFC14 and SFC15 must be used because the data length is more than 4.

⚠ **Attention:**
The control byte allows the changing of the registers of the module. It must always be 0 in order to avoid a change in the registers. A wrong mapping can change the function of the module!

Structure of the in- and output data for InterBus S (from firmware WF)

The module is a combined special function input and output module with 2 x 16 Bit in- and output data.

Input

Word	Description	
	High	Low
n (Bit0-Bit15)	Input byte0	Input byte1
n+1 (Bit16-Bit31)	Input byte2	Input byte3

Output

Word	Description	
	High	Low
n (Bit0-Bit15)	Output byte0	Output byte1
n+1 (Bit16-Bit31)	Output byte2	Output byte3

Attention:
For Interbus S the data is written in Motorola format (high Byte first). In connection with other fieldbus systems the Bytes in the data word are changed.

Attention:
The control byte allows the changing of the registers of the module. It must always be 0 in order to avoid a change in the registers. A wrong mapping can change the function of the module!

WAGO ⇒I/O⇒SYSTEM

Structure of the in- and output data for DeviceNet (from firmware 306V2.2)

The module has 6 Bytes input and output data in the Poll I/O data. Consumed (Tx for the Scanner) and produced (Rx for the Scanner) data size are each 6 Byte more.

Input

Byte	Description
D0	Control byte
D1	Input byte1
D2	Input byte0
D3	Input byte4
D4	Input byte3
D5	Input byte2

Output

Byte	Description
D0	Status byte
D1	Input byte1
D2	Input byte0
D3	Input byte4
D4	Input byte3
D5	Input byte2

Attention:
The control byte allows the changing of the registers of the module. It must always be 0 in order to avoid a change in the registers. A wrong mapping can change the function of the module!

Structure of the in- and output data for DeviceNet (from firmware 306V3.0)

The module has 4 Bytes input and output data in the polled I/O data.

Input

Byte	Description
D0	Input byte0
D1	Input byte1
D2	Input byte2
D3	Input byte3

Output

Byte	Description
D0	Input byte0
D1	Input byte1
D2	Input byte2
D3	Input byte3

Structure of the in- and output data for Modbus (from firmware V2.3)

The module is a combined special function input and output module with 2 x 16 Bit in- and output data.

Input

Word	Description	
	High	**Low**
n (Bit0-Bit15)	Input byte0	Input byte1
n+1 (Bit16-Bit31)	Input byte2	Input byte3

Output

Word	Description	
	High	**Low**
n (Bit0-Bit15)	Output byte0	Output byte1
n+1 (Bit16-Bit31)	Output byte2	Output byte3

Attention:
For Interbus S the data is written in Motorola format (high Byte first). In connection with other fieldbus systems the Bytes in the data word are changed.

Attention:
The control byte allows the changing of the registers of the module. It must always be 0 in order to avoid a change in the registers. A wrong mapping can change the function of the module!

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Structure of the in- and output data for CanOpen (from firmware WI)

The module is in the list with Index 0x2400 (input) and Index 0x2500 (output). The module has 2 subindexes.

2 Byte special modules, Inputs

Idx	SIdx	Name	Type	Attrib.	Default	Description
2400	0	special 2 byte input	Unsigned8	ro	none	number of 2 Byte channels
	....	....	....	....	....	....
	n	Input byte0, Input byte1	Unsigned16	ro	none, 0x0 for WD error	1. and 2. Input byte
	n+1	Input byte2, Input byte3	Unsigned16	ro	none, 0x0 for WD error	3. and 4. Input byte
	....	....	....	....	....	....
	0xFF	0xFF. Special input	Unsigned16	ro	none	255. Input channel

2 Byte special modules, Outputs

Idx	SIdx	Name	Type	Attrib.	Default	Description
2500	0	special 2 byte output	Unsigned8	ro	none	number of 2 Byte channels
	....	....	....	....	....	....
	n	Output byte0, Output byte1	Unsigned16	rw	none	1. and 2. Output byte
	n+1	Output byte2, Output byte3	Unsigned16	rw	none	3. and 4. Output byte
	....	....	....	....	....	....
	0xFF	0xFF. special output	Unsigned16	rw	none	255. Outputkanal

Attention:

The control byte allows the changing of the registers of the module. It must always be 0 in order to avoid a change in the registers. A wrong mapping can change the function of the module!

Structure of the in- and output data for CAL (from firmware WE)

Mode class 4:
The data is in the 2 Byte objects #BK_AI2W0_XXX, #BK_AI2W1_XXX and #BK_A02W0_XXX. Each module has 2 values.

Input

Mux	Content	Description
n	Input byte0, Input byte1	1. and 2. Input byte
n+1	Input byte2, Input byte3	3. and 4. Input byte

Output

Mux	Content	Description
n	Output byte0, Output byte1	1. and 2. Output byte
n+1	Output byte2, Output byte3	3. and 4. Output byte

Mode class 0:
The description of the data is the same as for class 4 mode. The data is put into objects No.1, No.2 and No.3 (read/write 2 Byte analog).

Attention:
The control byte allows the changing of the registers of the module. It must always be 0 in order to avoid a change in the registers. A wrong mapping can change the function of the module!

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Structure of the in- and output data for LIGHTBUS (from firmware WD)

Input

Word	Content		Description
	High	Low	
n	-	Statusbyte	Statusword
n+1	Input byte0	Input byte1	1. and 2. Input byte
n+2	-	Input byte4	5.Input byte
n+3	Input byte3	Input byte2	3. and 4. Input byte

Output

Word	Content		Description
	High	Low	
n	-	Statusbyte	Statusword
n+1	Output byte0	Output byte1	1. and 2. Output byte
n+2	-	Output byte4	5.Output byte
n+3	Output byte3	Output byte2	3. and 4. Output byte

Attention:

The control byte allows the changing of the registers of the module. It must always be 0 in order to avoid a change in the register. A wrong mapping can change the function of the module!

WAGO I/O SYSTEM

Use in Hazardous Environments

The **WAGO-I/O-SYSTEM 750** (electrical equipment) is designed for use in Zone 2 hazardous areas.

The following sections include both the general identification of components (devices) and the installation regulations to be observed. The individual subsections of the "Installation Regulations" section must be taken into account if the I/O module has the required approval or is subject to the range of application of the ATEX directive.

Identification

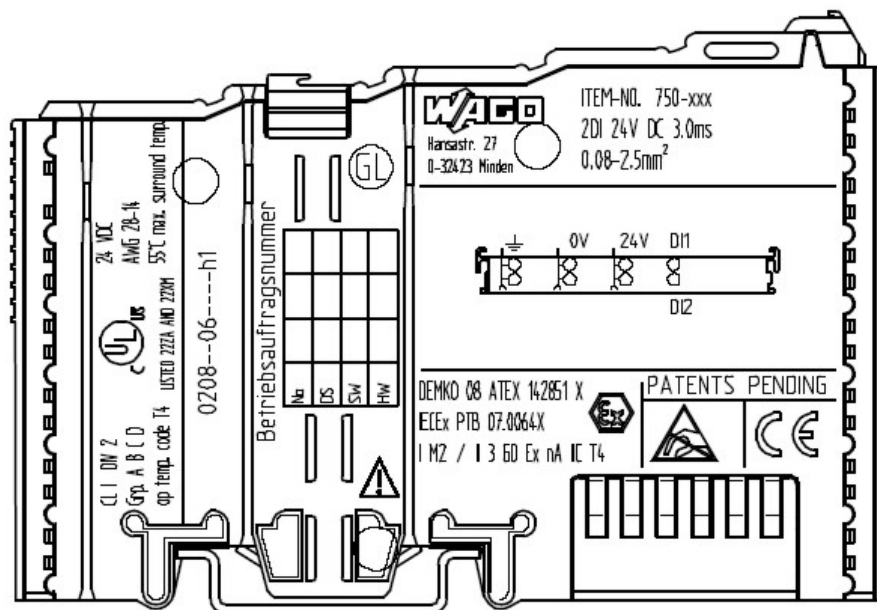## For Europe according to CENELEC and IEC

Figure 1: Example for lateral labeling of bus modules

DEMKO 08 ATEX 142851 X
IECEx PTB 07.0064X
I M2 / II 3 GD Ex nA IIC T4

Figure 2: Printing on text detail in accordance with CENELEC and IEC

Table 1: Description of Printing on

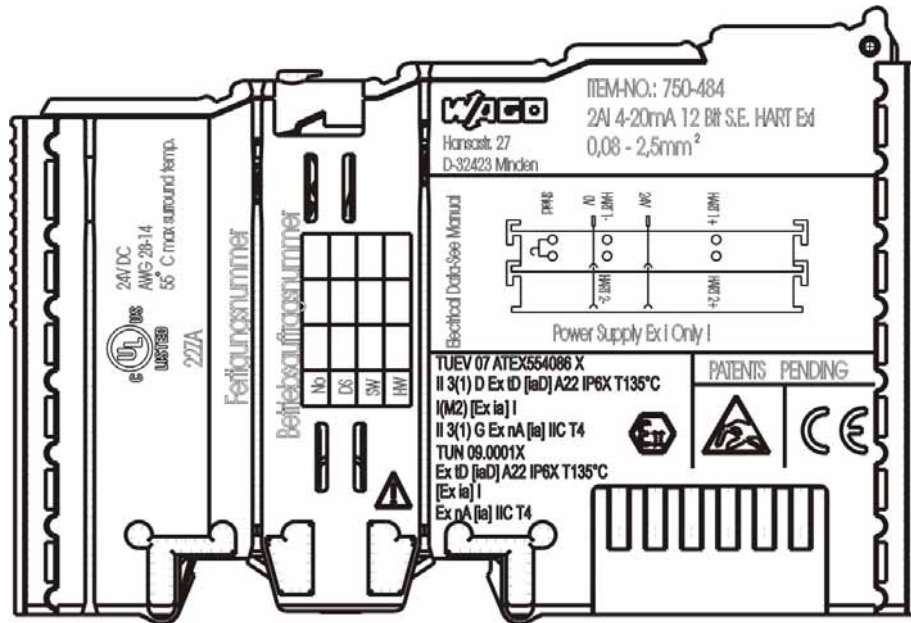| Printing on Text	Description
DEMKO 08 ATEX 142851 X IECEx PTB 07.0064X	Approval body and/or number of the examination certificate
I M2 / II 3 GD	Explosion protection group and Unit category
Ex nA	Type of ignition and extended identification
IIC	Explosion protection group
T4	Temperature class

Figure 3: Example of side marking of Ex i and IEC Ex i approved I/O modules

TUEV 07 ATEX554086 X
II 3(1) D Ex tD [iaD] A22 IP6X T135°C
I(M2) [Ex ia] I
II 3(1) G Ex nA [ia] IIC T4
TUN 09.0001X
Ex tD [iaD] A22 IP6X T135°C
[Ex ia] I
Ex nA [ia] IIC T4

Figure 4: Inscription text detail acc. CENELEC and IEC

Table 2: Description of the inscription

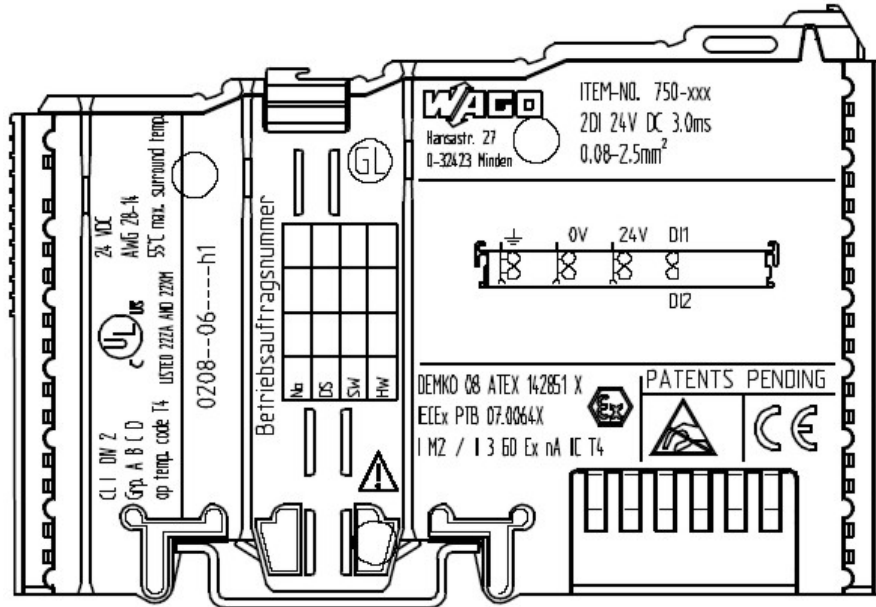| Inscription text	Description
TÜV 07 ATEX 554086 X TUN 09.0001X	Approving authority or certificate numbers
Dust	
II	Device group: All except mining
3(1)D	Device category: Zone 22 device (Zone 20 subunit)
Ex	Explosion protection mark
tD	Protection by enclosure
[iaD]	Approved in accordance with "Dust intrinsic safety" standard
A22	Surface temperature determined according to Procedure A, use in Zone 22
IP6X	Dust-tight (totally protected against dust)
T 135°C	Max. surface temp. of the enclosure (no dust bin)
Mining	
I	Device group: Mining
(M2)	Device category: High degree of safety
[Ex ia]	Explosion protection: Mark with category of type of protection intrinsic safety: Even safe when two errors occur
I	Device group: Mining
Gases	
II	Device group: All except mining
3(1)G	Device category: Zone 2 device (Zone 0 subunit)
Ex	Explosion protection mark
nA	Type of protection: Non-sparking operating equipment
[ia]	Category of type of protection intrinsic safety: Even safe when two errors occur
IIC	Explosion Group
T4	Temperature class: Max. surface temperature 135°C

For America according to NEC 500

Figure 5: Example for lateral labeling of bus modules

Figure 6: Printing on text detail in accordance with NEC

Table 3: Description of Printing on

Printing on Text	Description
CL 1	Explosion protection group (condition of use category)
DIV 2	Area of application (zone)
Grp. ABCD	Explosion group (gas group)
Optemp code T4	Temperature class

Installation Regulations

In the **Federal Republic of Germany**, various national regulations for the installation in explosive areas must be taken into consideration. The basis for this forms the working reliability regulation, which is the national conversion of the European guideline 99/92/E6. They are complemented by the installation regulation EN 60079-14. The following are excerpts from additional VDE regulations:

Table 4: VDE Installation Regulations in Germany

DIN VDE 0100	Installation in power plants with rated voltages up to 1000 V
DIN VDE 0101	Installation in power plants with rated voltages above 1 kV
DIN VDE 0800	Installation and operation in telecommunication plants including information processing equipment
DIN VDE 0185	lightning protection systems

The **USA** and **Canada** have their own regulations. The following are excerpts from these regulations:

Table 5: Installation Regulations in USA and Canada

NFPA 70	National Electrical Code Art. 500 Hazardous Locations
ANSI/ISA-RP 12.6-1987	Recommended Practice
C22.1	Canadian Electrical Code

NOTICE

Notice the following points
When using the **WAGO-I/O SYSTEM 750** (electrical operation) with Ex approval, the following points are mandatory:

Special Conditions for Safe Operation of the ATEX and IEC Ex (acc. DEMKO 08 ATEX 142851X and IECEx PTB 07.0064)

The fieldbus-independent I/O modules of the WAGO-I/O-SYSTEM 750-.../...-... must be installed in an environment with degree of pollution 2 or better. In the final application, the I/O modules must be mounted in an enclosure with IP 54 degree of protection at a minimum with the following exceptions:

- I/O modules 750-440, 750-609 and 750-611 must be installed in an IP 64 minimum enclosure.
- I/O module 750-540 must be installed in an IP 64 minimum enclosure for 230 V AC applications.
- I/O module 750-440 may be used up to max. 120 V AC.

When used in the presence of combustible dust, all devices and the enclosure shall be fully tested and assessed in compliance with the requirements of IEC 61241-0:2004 and IEC 61241-1:2004.

When used in mining applications the equipment shall be installed in a suitable enclosure according to EN 60079-0:2006 and EN 60079-1:2007.

I/O modules fieldbus plugs or fuses may only be installed, added, removed or replaced when the system and field supply is switched off or the area exhibits no explosive atmosphere.

DIP switches, coding switches and potentiometers that are connected to the I/O module may only be operated if an explosive atmosphere can be ruled out.

I/O module 750-642 may only be used in conjunction with antenna 758-910 with a max. cable length of 2.5 m.

To exceed the rated voltage no more than 40%, the supply connections must have transient protection.

The permissible ambient temperature range is 0 °C to +55 °C.

Special conditions for safe use (ATEX Certificate TÜV 07 ATEX 554086 X)

1. For use as Gc- or Dc-apparatus (in zone 2 or 22) the field bus independent I/O modules WAGO-I/O-SYSTEM 750-*** shall be erected in an enclosure that fulfils the requirements of the applicable standards (see the marking) EN 60079-0, EN 60079-11, EN 60079-15, EN 61241-0 and EN 61241-1. For use as group I, electrical apparatus M2, the apparatus shall be erected in an enclosure that ensures a sufficient protection according to EN 60079-0 and EN 60079-1 and the degree of protection IP64. The compliance of these requirements and the correct installation into an enclosure or a control cabinet of the devices shall be certified by an ExNB.

2. If the interface circuits are operated without the field bus coupler station type 750-3../…-… (DEMKO 08 ATEX 142851 X), measures must be taken outside of the device so that the rating voltage is not being exceeded of more than 40% because of transient disturbances.

3. DIP-switches, binary-switches and potentiometers, connected to the module may only be actuated when explosive atmosphere can be excluded.

4. The connecting and disconnecting of the non-intrinsically safe circuits is only permitted during installation, for maintenance or for repair purposes. The temporal coincidence of explosion hazardous atmosphere and installation, maintenance resp. repair purposes shall be excluded.

5. For the types 750-606, 750-625/000-001, 750-487/003-000, 750-484 the following shall be considered: The interface circuits shall be limited to overvoltage category I/II/III (non mains/mains circuits) as defined in IEC 60664-1.

6. For the type 750-601 the following shall be considered: Do not remove or replace the fuse when the apparatus is energized.

7. The ambient temperature range is: $0°C \leq T_a \leq +55°C$ (for extended details please note certificate).

Special conditions for safe use (IEC-Ex Certificate TUN 09.0001 X)

1. For use as Dc- or Gc-apparatus (in zone 2 or 22) the fieldbus independent I/O modules WAGO-I/O-SYSTEM 750-*** shall be erected in an enclosure that fulfils the requirements of the applicable standards (see the marking) IEC 60079-0, IEC 60079-11, IEC 60079-15, IEC 61241-0 and IEC 61241-1. For use as group I, electrical apparatus M2, the apparatus shall be erected in an enclosure that ensures a sufficient protection according to IEC 60079-0 and IEC 60079-1 and the degree of protection IP64. The compliance of these requirements and the correct installation into an enclosure or a control cabinet of the devices shall be certified by an ExCB.

2. Measures have to be taken outside of the device that the rating voltage is not being exceeded of more than 40% because of transient disturbances.

3. DIP-switches, binary-switches and potentiometers, connected to the module may only be actuated when explosive atmosphere can be excluded.

4. The connecting and disconnecting of the non-intrinsically safe circuits is only permitted during installation, for maintenance or for repair purposes. The temporal coincidence of explosion hazardous atmosphere and installation, maintenance resp. repair purposes shall be excluded.

5. For the types 750-606, 750-625/000-001, 750-487/003-000, 750-484 the following shall be considered: The interface circuits shall be limited to overvoltage category I/II/III (non mains/mains circuits) as defined in IEC 60664-1.

6. For the type 750-601 the following shall be considered: Do not remove or replace the fuse when the apparatus is energized.

7. The ambient temperature range is: $0°C \leq T_a \leq +55°C$ (for extended details please note certificate).

Special conditions for safe use (ATEX Certificate DEKRA 11ATEX0203 X)

1. The components shall be installed in a suitable enclosure providing a degree of protection of at least IP54 according to EN 60529, taking into account the environmental conditions under which the equipment will be used.

2. When the temperature under rated conditions exceeds 70 °C at the cable or conduit entry point, or 80 °C at the branching point of the conductors, the temperature specification of the selected cable shall be in compliance with the actual measured temperature values.

3. Provisions shall be made to prevent the rated voltages from being exceeded by transient disturbances of more than 40 %.

4. Components may only be removed or inserted when the system supply and the field supply are switched off, or when the location is known to be non-hazardous.

5. Fieldbus connectors may only be disconnected or connected when the system supply is switched oft, or when the location is known to be non-hazardous.

6. The fuses, present in the system modules 750-6xx may only be replaced when the supply is switched off, or when the location is known to be non-hazardous.

7. Address selectors and ID switches may only be adjusted when the system supply is switched off, or when the location is known to be non-hazardous.

8. The ambient temperature range is: $0°C \leq T_a \leq +55°C$.

ANSI/ISA 12.12.01

This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D or non-hazardous locations only.

NOTICE

Explosion hazard!
Explosion hazard - substitution of components may impair suitability for Class I, Div. 2.

NOTICE

Disconnect device when power is off and only in a non-hazardous area!
Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

When a fuse is provided, the following marking shall be provided:
"A switch suitable for the location where the equipment is installed shall be provided to remove the power from the fuse".
The switch need not be integrated in the equipment.

For devices with Ethernet connectors:
"Only for use in LAN, not for connection to telecommunication circuits".

NOTICE

Use only with antenna module 758-910!
Use Module 750-642 only with antenna module 758-910.

Information

Additional Information
Proof of certification is available on request. Also take note of the information given on the module technical information sheet. The Instruction Manual, containing these special conditions for safe use, must be readily available to the user.

Approvals

More Information about Approvals
Detailed references to the approvals are listed in the document "Overview Approvals **WAGO-I/O-SYSTEM 750**", which you can find on the DVD "AUTOMATION Tools and Docs" (Item-No.: 0888-0412) or via the internet under: www.wago.com → Service → Documentation → WAGO-I/O-SYSTEM 750 → System Description.

The following approvals have been granted to 750-334 INTERBUS Fieldbus Coupler:

$C\epsilon$ Conformity Marking

cUL$_{US}$ (UL508)

The following Ex approvals have been granted to 750-334 INTERBUS Fieldbus Coupler:

⟨Ex⟩   DEKRA   II 3 G Ex nA II T4

⟨Ex⟩   WE KG   DT / Gz ''pC'' KV6'''

cUL$_{US}$ CULUS (ANSI/ISA 12.12.01)   Class I Div2 ABCD T4

Standards and Guidelines

750-334 INTERBUS Fieldbus Coupler meet the following requirements on emission and immunity of interference:

EMC CE-Emission of interference   acc. to EN 61000-6-4: 2007

EMC CE-Immunity to interference   acc. to EN 61000-6-2: 2005

ATEX guideline   acc. to EN 60079-0: 2006 and
                                       acc. to EN 60079-15: 2005

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